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READING:

ITS PSYCHOLOGY AND PEDAGOGY

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The Century Education Series

READING

ITS PSYCHOLOGY AND PEDAGOGY

A Summary of Experimental Studies in Reading

BY

JOHN ANTHONY O'BRIEN, PH.D.

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AUTHOR OF "SILENT READING"

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To

DAVID KINLEY

PRESIDENT OF THE UNIVERSITY OF ILLINOIS

Teacher, Scholar, and Generous
Inspirer of Youth
in Token of Friendship and Esteem and
in Acknowledgment of My Indebtedness

THIS BOOK IS AFFECTIONATELY DEDICATED
BY THE AUTHOR

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PREFACE

Upon probably no subject in the elementary school curriculum is there focussed a deeper or more sustained interest on the part of teachers, school administrators, and students of modern education than upon reading.

This widespread interest is largely traceable to two factors. First, the large volume of painstaking, scientific research, especially during the last decade, into the psychological and physiological nature of the reading process has yielded rich results. These findings are pregnant with helpful suggestions to the teacher in the practical conduct of the work in reading. They constitute the solid, scientific groundwork upon which are built effective methods of training in reading. They point the way to the construction of the most fruitful technique for the development of reading ability.

Secondly, there is an aroused consciousness and a keener realization now of the importance and value of effective habits of reading, especially of silent reading. The constantly increasing productiveness

of the present-day press, turning out so much that attracts the attention and lures the interest, renders its treasures available largely in proportion to the individual's mastery and skill in reading. There is so much of value to read, and so little time in which to read it, that a premium is placed upon the ability to gather the thought from the printed page with a minimum expenditure of time and effort. These two considerations have greatly stimulated the widespread interest in reading until now it forms the leading topic in teachers' institutes, discussion groups, and reading circles.

The great avenue for the communication of knowledge, thought, and ideas has shifted from the oratory of ancient times to the printing press of today. The chief sources of education for probably the majority of the people at the present time are books. They are the rich mines of information and knowledge on all subjects. They are the sublimation of the best thought and experience of the greatest minds of the race. Reading is the key which opens these treasure-houses of thought and knowledge by unlocking the symbols on the printed page—closed forever to the illiterate.

This book aims to place before the teacher in simple, nontechnical language, the results of prac-

tically all the important, recent scientific investigations into the psychological and physiological nature of the reading process that have yielded results of practical pedagogical consequence. Besides presenting the definite results of experimental research, the effort has been made *to interpret the pedagogical implications of these findings and to point out their practical application to the work of the teacher in the classroom.* It is thought that this latter service particularly will appeal to the teacher who is anxious to enrich her work with all the findings of modern science, but who has neither the time nor the training necessary to analyze the data in many rigidly scientific investigations of a technical character.

It has also been the aim of the author to introduce the teacher to a knowledge of the salient features of the methods employed in scientific investigations of reading, so that teachers would then be in a position to employ a type of technique suitable for the investigation of reading problems in their own classroom. Moreover, a knowledge of the methods by which results have been secured is apt to shed an interesting and significant light upon the results themselves.

It is felt that the searching, detailed analysis of

the reading situation revealing the different types of reading and the numerous adjustments made by such factors as the character of the subject matter, the kind of attention, and the purpose for which the material is read, will clarify the work of the teacher and indicate the necessity of specific training in radically different types of reading and the wisdom of having definite, clear-cut aims in the teaching of reading. Reading will then no longer be viewed as a rigidly uniform mechanical process—which view has been largely responsible for the slow, halting, mechanical, dawdling, and uninteresting poring over the printed page which has been miscalled "reading"—but it will be seen to be an almost infinitely complex process with different types, and numerous delicate adjustments in reading attitude, in the degree of tension in the central nervous system, and in the conscious patterns for the organization and interpretation of visual impressions. It is only after the teacher has secured a knowledge of these psychological differences in the reading processes that she will be able to adapt her methods accordingly, in order to meet real needs and to secure the best results.

The teaching of reading has already been greatly improved as a direct consequence of the findings of

scientific research and the distinctions set forth by the educational psychologist. There is every reason to believe that reading will continue to improve as the frontiers of knowledge are pushed farther back and there is developed a greater body of scientific data concerning the nature of the reading process and the factors influencing it. But the knowledge, to influence classroom procedure, must be brought from the fields of scientific research and the psychological laboratory and translated to the teacher in the classroom. In serving as such a vehicle and such a translation, this book finds its essential *raison d'être.*

The person who tries to learn to swim or to play tennis by his own unguided efforts, by a sort of trial and error process, may succeed; but he is almost certain to form habits in which there are many wasteful and ineffective movements, in which there is much lost motion. The individual, on the other hand, who is trained in the proper strokes, in the most effective technique, by a teacher who distinguishes between the wasteful and the effective strokes, will make far more rapid progress and gain a far greater mastery of the art. So too with reading. The individual who has received training in the various adjustments adapted to different types

of reading, and for a variety of purposes, will display a flexibility, a suppleness, a technique, suited to all these widely varying reading activities which will enable him to surpass greatly the individual to whom reading is one rigidly uniform mechanical procedure.

The author is under many obligations because the book brings within its covers the ripe fruit of the years of painstaking scientific research of many workers. To Charles H. Judd for his searching psychological analysis of the reading process, not less than for the many investigations he has directed, to G. T. Buswell, W. S. Gray, C. T. Gray, and P. W. Terry, there is an especial indebtedness. The results of their careful scientific studies of reading, which are embodied in some detail in this volume, are among the outstanding recent contributions to our knowledge of reading.

The book also reflects the results of the studies of many other workers in the field, such as Raymond Dodge, W. F. Dearborn, W. H. Smith, C. R. Stone, and especially that great pioneer investigator of reading, Edmund B. Huey. To G. T. Buswell for his gracious permission to reproduce certain graphs from his monographs, the author's thanks are due.

Edward H. Cameron, Professor of educational

psychology at the University of Illinois, and John A. Clark of the Bureau of Educational Research at the same institution, read the entire manuscript and favored the author with many helpful suggestions and criticism. To Michael V. O'Shea, Professor of Education at the University of Wisconsin, he is indebted both for the suggestion to undertake the work and for his unfailing encouragement in carrying it through to completion. The author acknowledges gratefully, too, the advantage of having the editorial supervision of Charles E. Chadsey, Dean of the College of Education at the University of Illinois.

The author will feel well compensated for his years of labor in the preparation of this volume, if the work serves to open up for the teacher a new vista and a deeper insight into the nature of the reading process and quickens the interest in her work. The author also cherishes the hope that the volume may render the work in reading more pleasant and more effective for both the teachers and the pupils in the schoolrooms of America.

JOHN A. O'BRIEN

EDITOR'S INTRODUCTION

That the permanency and stability of a democracy depend upon the efficiency of the educational training of its constituent members is accepted as axiomatic. The steady upward trend of the curve of educational preparation for citizenship, as evidenced by the average number of days of schooling secured before permanently ending formal training, constitutes a genuinely encouraging evidence of the soundness of our educational theories and of the firm foundations upon which our democracy is builded.

Whatever the degree or amount of formal education which may have been attained, it is evident that the training received in Reading is of fundamental importance. Efficiency in any of the subjects of the curriculum is dependent primarily upon ability to comprehend the written word. The great range of ability in comprehension and speed in reading indicates that greater attention to the underlying elements, physiological and psychological, upon which intelligent reading depends should be

given by all connected directly or indirectly with the teaching of this subject.

Fortunately we now have available an immense amount of critical, scientific material bearing directly upon the physiological elements involved in the reading process. The practical application of the knowledge thus obtained to the improving of reading ability constitutes one of our most important educational problems.

Unfortunately, relatively few of those actually engaged in teaching reading have acquainted themselves either with the results of scientific investigation of reading or with the application of these results to reading technique. We need to have more volumes dealing with the psychology and pedagogy of reading suitable to the comprehension and capable of sustaining the attention and interest of our army of reading teachers.

Through an intelligent utilization of what is now known to be involved in the acquisition of skill and facility in reading we can rest assured that corresponding improvements in the work of the entire elementary curriculum will follow. In fact, already a decidedly improved technique has been formulated and is in successful operation in many of our more progressive schools.

The author of this volume has in a painstaking way surveyed the whole field of experimental investigations in reading together with their practical applications to teaching. While no effort has been made to evade the discussion of the psychological and physiological principles involved, the non-technical treatment of the subject makes the reading of the text interesting and stimulating. All interested in knowing the results of modern investigations in reading will find here a wealth of valuable information presented in a systematic and effective manner.

CONTENTS

PAGE

CHAPTER I READING: ITS HISTORY AND ITS CULTURAL RÔLE 3

The pictograph stage—the ideograph stage—the phonogram stage—the rebus-phonogram stage—the alphabet stage—the cultural value of reading—familiarity with the great minds of the race—the values of imaginative literature—the values of poetry—its fundamental importance as a tool subject—the amount of money spent for the teaching of reading compared with other school subjects—problems and topics for discussion and investigation—references

CHAPTER II COMPARISON OF SILENT AND ORAL READING 25

Comparison of rate in silent and oral reading—comparison of comprehension in silent and oral reading—values of oral reading—values of silent reading—exclusive teaching of oral reading—an anachronism—evil effects of over-emphasis on oral reading—shift emphasis from oral to silent reading—the psychology of meanings—the function of pictures—material should be within the scope of the child's experience—material should appeal to child's interest—problems and topics for discussion and investigation—references

CHAPTER III THE PHYSIOLOGICAL BASIS OF READING . 51

Evolution of technique for photographing eye-movements—what photographic records reveal—physiological basis of difference between silent and oral reading—good readers generally have a wide eye-voice span—poor readers generally have a narrow eye-voice span—conclusions—the complex character of meaning—wide general attention span is underlying cause—problems and topics for discussion and investigation—references

CHAPTER IV GROWTH STAGES IN THE FUNDAMENTAL ELEMENTS OF READING 86

Insight into the psychophysical process of reading renders the teacher's work more interesting—steps in trau-

PAGE

sition to reading maturity—rate of reading measures growth—standardized educational tests measure growth—photographic records of eye-movements reveal growth in the different fundamental elements of reading—growth in the visual span—growth in the rate of recognition—growth in regularity of eye-movement—correlation of growth curves with reading efficiency—comparison of growth curves for the three elements of silent reading—problems and topics for discussion and investigation—references

CHAPTER V ADJUSTMENTS IN READING IN DIFFERENT TYPES OF MATERIAL 115

Width of visual span is affected—other adjustments—significance of changes in eye-movements—reading patterns are complex—conclusions—adapting reading to the end in view—lack of definite, well-ordered plan of attack in reading—need of specific training in reading for different purposes—fluent, straightforward reading is sidetracked in analytical study—conclusions—problems and topics for discussion and investigation—references

CHAPTER VI THE READING OF FOREIGN LANGUAGES . . 141

Reading of French shows great difficulties are encountered—reading of Latin is metamorphosed into analysis—conclusions—effective methods of teaching are based upon psychological distinctions—spelling and reading were formerly confused—distinction between reading and phonetics—perception—visual and auditory—relation of articulation to meanings—psychological distinctions afford basis for different pedagogical methods—reading and skimming—change in methods in passing from primary through intermediate grades—type of American textbook—library reading material—the English classics—the breakdown of Latin teaching—problems and topics for discussion and investigation—references

CHAPTER VII CHARACTERISTICS OF ARITHMETIC READING 165

Partial first reading and re-reading—conclusions—photographic records of arithmetic reading—conclusions—practical applications to classroom teaching—analysis of arithmetic problem complex—when methods should be introduced—problems and topics for discussion and investigation—references

PAGE

CHAPTER VIII READING DIFFICULTIES: THEIR DIAGNOSIS AND REMEDIAL TREATMENT THROUGH THE USE OF STANDARDIZED TESTS 181

Final aim of tests is to improve teaching—careful administration of the tests—computation of the individual scores and the class average—interpretation of the scores—planning remedial instruction—use of reading tests in Cleveland survey—diagnosis of individual needs—diagnostic reading charts—beneficial results of corrective treatment—individualizing the instruction—conclusions—problems and topics for discussion and investigation—references

CHAPTER IX READING DIFFICULTIES: THEIR DIAGNOSIS AND REMEDIAL TREATMENT BY CLINICAL METHOD 207

History of cases—inferior learning capacity—congenital word blindness—poor auditory memory—defective vision—narrow span of recognition—ineffective eye-movements—inadequate training in phonetics—inadequate attention to the content—inadequate speaking vocabulary—small meaning vocabulary—speech defects—lack of interest—guessing versus accurate recognition—timidity—exercises to increase accuracy of recognition—exercises to increase span of recognition—exercises to increase ability in word recognition—exercises to aid in interpretation—conclusions concerning remedial instruction—analysis in school work—summary concerning individual differences—problems and topics for discussion and investigation—references

CHAPTER X THE DEVELOPMENT OF SILENT READING ABILITY 247

Practice in rapid silent reading—decrease of vocalization in silent reading—training in perception—character of subject matter—habits of eye-movement—purpose for which subject matter is read—concentration of attention—ability to grasp the contents—recognition of the value of rapid reading—will to read rapidly—pressure of a time control—individual graph—class chart—statement of method—preparation—directions to pupils—statement of method to decrease vocalization in silent reading—teacher's preparation—extra-foveal vision—meaning premonitions—foveal vision—statement of method—the fundamental idea—the transfer

PAGE

of perception to printed page—instructions to pupils in perception—teacher's preparation—problems and topics for discussion and investigation—references

CHAPTER XI IMPROVEMENTS IN READING EFFECTED BY TRAINING 281

The results—the effect upon comprehension—the relative amount of gain made by different grades—average rates attained by pupils after training compared with present norms—tentative norms for pupils trained in rapid silent reading—increase in rate shown by class charts—problems and topics for discussion and investigation—references

INDEX 305

TABLES

		PAGE
TABLE 1	THE PORTION OF EACH THOUSAND DOLLARS SPENT FOR THE TEACHING OF READING IN EACH OF THE FIRST SIX GRADES AS COMPARED WITH ITS NEAREST COMPETITORS	20
TABLE 2	SPEED IN ORAL AND SILENT READING	27
TABLE 3	RELATIVE ABILITY IN SILENT AND ORAL READING	27
TABLE 4	AVERAGE EYE-VOICE SPAN BY GRADES—ELEMENTARY SUBJECTS	70
TABLE 5	PERCENTAGE OF INCREASE IN GROWTH CURVES OF THREE EYE-MOVEMENTS HABITS—SILENT READING	111
TABLE 6	RECORD OF UNIVERSITY STUDENT IN SILENT READING OF DIFFERENT KINDS OF PASSAGES	119
TABLE 7	RECORDS OF HIGH SCHOOL STUDENTS UNDER VARYING CONDITIONS OF EXPECTANCE OF QUESTIONS	128
TABLE 8	RECORD OF A SUBJECT IN VARIOUS TYPES OF READING AND ANALYSIS	134
TABLE 9	RECORD OF SUBJECT A 29 IN SILENT READING OF MIXED PASSAGES AND A LATIN PASSAGE	146
TABLE 10	SHOWING AVERAGE RATE OF READING FOR EXPERIMENTAL (A) AND "CONTROL" (B) PUPILS AT BEGINNING AND END OF TRAINING PERIOD AS DETERMINED BY COURTIS SILENT READING TEST FOR GRADES VI–VII	283
TABLE 11	COMPARISON OF AVERAGES IN RATE ATTAINED BY PUPILS AFTER TRAINING—WITH PRESENT NORMS	291
TABLE 12	O'BRIEN'S TENTATIVE NORMS FOR PUPILS TRAINED IN RAPID SILENT READING	291

ILLUSTRATIONS

			PAGE
FIGURE	I	COMBAT	7
FIGURE	II	THE RESPECTIVE COSTS OF TEACHING READING, ARITHMETIC AND SPELLING . . .	21
FIGURE	III	DEVELOPMENT OF THE EYE-VOICE SPAN OF 54 SUBJECTS	72
FIGURE	IV	THE DEVELOPMENT OF THE ATTENTION SPAN IN READING, SHOWING ALSO THE LOCATION OF MEANING IN VARIOUS STAGES OF READING EFFICIENCY	78
FIGURE	V	GROWTH STAGES IN SPAN OF RECOGNITION IN SILENT AND ORAL READING AS SHOWN BY THE NUMBER OF FIXATIONS PER LINE . .	99
FIGURE	VI	GROWTH STAGES FOR AVERAGE DURATION OF FIXATION PAUSES IN SILENT AND ORAL READING	106
FIGURE	VII	GROWTH CURVES IN REGULARITY OF PROCEDURE ALONG THE LINE, IN SILENT AND IN ORAL READING, AS SHOWN BY THE AVERAGE NUMBER OF REGRESSIVE MOVEMENTS PER LINE	109
FIGURE	VIII	PERCENT OF INCREASE IN GROWTH FOR THREE EYE-MOVEMENT HABITS—SILENT READING	110
FIGURE	IX	AVERAGE SCORES IN THE RATE OF SILENT READING OF 1,831 CLEVELAND PUPILS AND OF 2,654 PUPILS IN THIRTEEN OTHER CITIES. DATA ARE FOR GRADES FROM SECOND THROUGH EIGHTH	190

PAGE

FIGURE X Average scores in the quality of silent reading of 1,831 Cleveland pupils and of 2,654 pupils in thirteen other cities. Data are for grades from second through eighth 191

FIGURE XI Comparison of the Cleveland schools and twenty-three Illinois schools in oral reading 192

FIGURE XII Diagnostic chart to be used with Courtis Reading Test 194

FIGURE XIII Diagnostic reading chart showing distribution of thirty-seven pupils in eighth grade class in a St. Louis school 195

FIGURE XIV Diagnostic reading chart showing distribution of forty-two pupils in eighth grade class in a St. Louis school . . 197

FIGURE XV Graphs showing comparison of scores in rate of reading of pupils in Gardenville school, St. Louis, with scores achieved after one year of remedial treatment 199

FIGURE XVI Graphs showing comparison of scores in comprehension in reading of pupils in Gardenville School, St. Louis, with scores achieved after one year of remedial treatment 200

FIGURE XVII Average rate of reading for experimental (A) and control (B) pupils at beginning, middle and end of training period as determined by Courtis Silent Reading Test 284

FIGURE XVIII Average comprehension in reading for experimental (A) and control (B) pupils at beginning, middle and end of training period as determined by Courtis Silent Reading Test . . . 285

PAGE

FIGURE XIX AVERAGE GAIN IN RATE OF READING FOR GRADES IV TO VIII AS DETERMINED BY COURTIS SILENT READING TEST . . . 287

FIGURE XX AVERAGE RATE FOR PUPILS AFTER TRAINING IN RAPID READING AS REPORTED BY O'BRIEN COMPARED WITH NORMS REPORTED BY COURTIS FOR ORDINARY READERS . . . 292

FIGURE XXI AVERAGE RATE FOR PUPILS AFTER TRAINING IN RAPID READING AS REPORTED BY O'BRIEN, COMPARED WITH NORMS REPORTED BY OBERHOLZER AND BY GRAY FOR ORDINARY READERS 293

FIGURE XXII AVERAGE RATE FOR PUPILS AFTER TRAINING IN RAPID READING AS REPORTED BY O'BRIEN, COMPARED WITH NORMS REPORTED BY BROWN AND BY STARCH FOR ORDINARY READERS 295

FIGURE XXIII GRAPH SHOWING MEDIAN RATE OF READING FOR 7 FOURTH-GRADE CLASSES—117 PUPILS 298

FIGURE XXIV DEVELOPMENT IN SPEED OF READING BY A SIXTH-GRADE CLASS 299

FIGURE XXV GRAPH SHOWING MEDIAN RATE OF READING FOR 7 SEVENTH-GRADE CLASSES—119 PUPILS 300

PLATE I SILENT READING BY A FOURTH-GRADE PUPIL, BEFORE TRAINING 55

PLATE. II SILENT READING BY A FIFTH-GRADE PUPIL, AFTER TRAINING 56

PLATE III SILENT READING BY AN ADULT SUBJECT . . 61

PLATE IV ORAL READING BY AN ADULT SUBJECT . . . 62

PLATE V EYE-VOICE SPAN OF A GOOD READER IN GRADE VI 68

PLATE VI EYE-VOICE SPAN OF A POOR READER IN GRADE II 71

PAGE

PLATE VII RECORD OF EYE-MOVEMENTS OF A READER WHILE ATTEMPTING TO PARAPHRASE A LINE . . . 136

PLATE VIII THE SAME RECORD AS IN PLATE VII . . . 136

PLATE IX RECORD OF A SUBJECT TRANSLATING ORALLY A FRENCH PASSAGE 143

PLATE X RECORD OF A SUBJECT READING SILENTLY A SIMPLE LATIN PASSAGE 145

READING: ITS PSYCHOLOGY AND PEDAGOGY

Reading: Its Psychology and Pedagogy

CHAPTER I

READING: ITS HISTORY AND ITS CULTURAL RÔLE

Reading has a long and interesting history. The story of its origin and development is closely intertwined with the story of the progress of human civilization. For it has been chiefly through the agency of reading that man has entered into the possession of the best thought and experience of all the generations which have preceded him. These constitute for him his intellectual and social heritage.

The History of Reading

The student who seeks to trace the origin of the mysterious art of reading finds the trail lost in the twilight of antiquity. Recent explorations in Crete have unearthed inscriptions which scientists estimate belong to the early part of the third millenium before the Christian era. Seven thousand years

ago, Clodd concludes after extensive research, writing in Egypt was passing the pictograph stage and had become at least partially alphabetic. While many of the details of the story of the origin and development of reading and writing are lacking, enough written records have been preserved from the remote past to enable the historian to sketch the chief stages in the evolution.

A brief survey of these stages furnishes the student with a background to appreciate the wonders of the alphabet, and the tremendous rôle which the reading of its characters has played in the life of the race. Indeed, it is not difficult to believe that if the child knew something of its history, and the long gropings of his ancestors after the alphabet, as well as of their centuries of experience with more primitive but less serviceable characters, he would find the mastery of the alphabet and the task of learning to read less tedious and irksome and far more interesting. The apparently artificial and meaningless mechanical character of disconnected alphabetical letters and sounds would yield to an appreciation of the almost magical service which the letters of the alphabet render in representing to the eye all that men have said, and all that men can say, in languages which count their words by the hundreds of thousands. It is a story

which is shot through with the elements of pioneering and adventure, and in it are to be found the thrill of discovery and signal achievement. For the discovery of the alphabet, gradual though it was, remains not only "one of the greatest and most momentous triumphs of the human mind" but forms also one of the most fascinating chapters in this history of human progress.

The Pictograph Stage.—The first stage in the evolution of writing was the making of pictures in the air. They were read as rapidly as they were fashioned. This was the beginning of reading. Gesture-language and oral speech were thus the two means of communication used by primitive man. So inseparably connected were the two that for some tribes communication was rendered extremely difficult in the dark when the language of the gestured pictures could not be read.

From fashioning pictures in the air to drawing them in the sand, on trees, cliffs, and rocks, is a short and easy step. Moreover, the latter method offered greater advantages in the expression of the relationship between the various elements in the sentence. Thus, the natives in Central Brazil were accustomed to supplement their gesture-language with designs in the sand, when the gestures failed to make the meaning clear. Concerning this, Hirn

in his *Origins of Art* says: "These designs are only a projection on a different surface of the hand movements with which in their pantomimic language they described the outlines of the objects in the air. One is tempted, therefore, to find in these transferred gestures the origin of pictorial art."

Many interesting specimens of this pictorial language are still extant. From the fact that among these relics sketches of animals long extinct have been found, scientists estimate that the pictorial language reaches far back into the history of the human family. Thus Clodd in his *Story of the Alphabet* writes: "On fragments of bone, horn, schist, and other materials, the savage hunter of the Reindeer Period, using a flint-flake, depicted alike himself and the wild animals which he hunted. From cavern-floors of France, Belgium, and other parts of western Europe, whose deposits date from the Old Stone Age, there have been unearthed rude etchings of naked hardy men, brandishing spears at wild horses or creeping along the ground to hurl their weapons at the urus or wild ox, or at the wooly-haired elephant. A portrait of this last-named, showing the creature's shaggy ears, long hair and upwardly turned tusks, its feet being hidden in the surrounding high grass, is one of the most famous examples of paleolithic art."

The Ideograph Stage.—The second stage in the evolution occurred when pictographs began to be employed to represent not merely objects of sense, but emotions, ideas, and feelings. The pictograph evolved into the ideograph, or the symbol of an idea or thought. Thus Hoffman shows that, by metonymy, the idea of combat came to be symbolized simply by two spear heads pointed against each other, as shown in Figure 1. These

FIGURE 1

COMBAT (FROM HOFFMAN)

ideographs, becoming conventionalized for a whole tribe or race, became extensively used. Indeed, Hoffman, after careful investigation, asserts that "ideographs representing abstract ideas pictorially expressed are more frequent in the pictography of some tribes than the mere portraiture of objects pure and simple." Among the Indians, for example, peace was symbolized by a pipe; war, by a tomahawk.

The Phonogram Stage.—The third stage in the evolution is found in the development of phonograms, or graphs representing to the eye the sound of spoken words. The number of spoken words was

greatly increased to meet the needs of a growing civilization. But while material objects could be represented by pictographs, and ideas and feelings by ideographs, there was lacking a means of representing to the eye the sounds of spoken language. To meet this exigency, characters were invented to represent sounds. In the beginning, practically every oral word came to have its corresponding phonogram or sound picture of the whole word. The large number of phonograms necessary to keep pace, however, with the constantly increasing number of words in oral language rendered the problem of written communication a serious one. It was no easy task to master the large number of phonograms, and so the written communication of oral language remained difficult and unwieldy.

The Rebus-Phonogram Stage.—The fourth step in the process occurred when men gradually came to realize, as Huey says, "that a character might represent a sound as such, independent of the sound's meaning. From this the significant advance was made of representing a polysyllabic word by a succession of characters representing the sound of one of its syllables, practically the rebus with which children puzzle each other today." Commenting on this similarity, Taylor writes: "Indeed, the puzzles of this kind in children's books keep

alive to our own day the great transition stage from picture-writing to word-writing, the highest intellectual effort of one period in our history coming down, as so often happens, to be the child's play of a later time."

The Alphabet Stage.—It seems to have been a long time, however, before it dawned upon man that all the words which the human tongue can utter are composed of a relatively small number of unit sounds. The pushing of the analysis of the word-whole one step beyond a syllable into the constituent sounds of the syllable itself, and the representing of each of these constituent unit sounds by a separate character, marks the fifth and final stage in the great evolution. It marks the birth of the alphabet, the solving for all time of the problem of facile communication, the finding of the magical keys which open up the treasure-houses of learning and knowledge, and places in permanent form, accessible to all who master these simple symbols, the experience and wisdom of the race.

Even at this late day, there still remain races which have yet to make the epoch-making discovery of an alphabet. The Chinese, the largest of all the races numerically, still remain in the fourth stage, the rebus-phonogram stage, where they have been for thousands of years. Their language consists

only of monosyllables, as they have never analyzed these into their constituent letter sounds. "With all their acuteness," as Huey has pointed out, "it has never occurred to them to analyze their monosyllables, acrologically or otherwise, and arrive at their A B C's. At any rate, the usefulness of such a procedure never dawned upon them. As one of the baneful results, according to Taylor, it may fairly be said that with the Chinese method it takes twenty years instead of five to learn to read and write, and most people cannot be expected to attain to these arts."

This brief historical survey enables one to secure an insight into the early gropings of the race, revealing its ceaseless, insistent strivings through the ages to devise effective means for the communication of ideas, thoughts, and feelings through the agency of written symbols. The retrospective glance discloses the age-long experimentation of the race, proceeding apparently by a *trial and error method* first with pictographs, or rude drawings of objects, then with ideographs or figurative representations of ideas and feelings, later devising phonograms to represent the sound of word-wholes, which were finally analyzed into their constituent syllabic sounds with corresponding graphic characters. The culmination of this long process of ex-

perimentation is reached when the syllable is broken into its constituent sounds, and letters are devised to represent these ultimate sound units, thus ushering into the world the alphabet. The letters of the alphabet with their almost infinite possibilities of combinations are thus seen to be the most effective method of control, or the best tool which the race has been able to devise to meet the fundamental human need of communication through written or printed symbols. "Could the pre-phonetic scribe of Egypt," says Huey, "have had a vision of such a system and its possibilities, he would have deemed it the miracle of miracles. His thousands of characters and his fertility of resource in their use were taxed to their utmost to produce results that were far inferior to the work of these simple letter-forms."

The Cultural Value of Reading.—If the days of Demosthenes and Cicero were the days of oratory, the present is the age of the press. No longer is oratory the most important, and much less the sole, agency for the dissemination of thought and knowledge. The invention of the art of printing has revolutionized the methods for the propagation of knowledge. The products of the present-day press, in the form of newspapers, magazines, and books, almost overwhelm us with their teeming bulk.

Every happening of importance on the surface of the earth, in the sea, or in the air, finds its way into the daily press. Every discovery in the natural sciences, every development in the social sciences, every important step in the progress of the race, almost every achievement of permanent value is chronicled in the printed literature of the world. He who would keep abreast of the great daily developments in the world, and would keep his finger on the social pulse of the day, must be a constant interpreter of printed symbols. The cultivation of efficient reading habits becomes, therefore, of constantly increasing importance. For books have become the great vehicles of knowledge, inspiration, and culture.

There would seem to be little if any exaggeration in the statement of Carlyle: "We learn to read, in various languages, in various sciences; we learn the alphabet and letters of all manner of Books. But the place where we are to get knowledge, even theoretic knowledge, is the Books themselves! It depends on what we read, after all manner of Professors have done their best for us. The true University of these days is a Collection of Books. . . . All that mankind has done, thought, gained, or been, it is lying as in magic preservation in the pages of Books."

Familiarity with the Great Minds of the Race.—The opportunity that is open to all to come into intimate acquaintance with the greatest minds of the race through the reading of the great masterpieces of the world, finds happy expression in Ruskin:

"We may intrude ten minutes' talk on a cabinet minister, answered probably with words worse than silence, being deceptive; or snatch, once or twice in our lives, the privilege of throwing a bouquet in the path of a princess, or arresting the kind glance of a queen. And yet these momentary chances we covet; and spend our years, and passions, and powers in pursuit of little more than these; while, meantime, there is a society continually open to us, of people who will talk to us as long as we like, whatever our rank or occupation;—talk to us in the best words they can choose, and with thanks if we listen to them. And this society, because it is so numerous and so gentle,—and can be kept waiting round us all day long, not to grant audience, but to gain it; kings and statesmen lingering patiently in those plainly furnished and narrow anterooms, our bookcase shelves,—we make no account of that company,—perhaps never listen to a word they would say, all day long!

"This court of the past differs from all living

aristocracy in this: it is open to labor and to merit, but to nothing else. No wealth will bribe, no name overawe, no artifice deceive, the guardian of those Elysian gates. In the deep sense, no vile or vulgar person ever enters there. At the portières of that silent Faubourg St. Germain, there is but brief question, 'Do you deserve to enter?' 'Pass. Do you ask to be the companions of nobles? Make yourself noble, and you shall be. Do you long for the conversation of the wise? Learn to understand it, you shall hear it. But on other terms?—no. If you will not rise to us, we cannot stoop to you. The living lord may assume courtesy, the living philosopher explain his thought to you with considerable pain; but here we neither feign nor interpret; you must rise to the level of our thoughts if you would be gladdened by them, and share our feelings, if you would recognize our presence.' ''

The Values of Imaginative Literature.—Describing the cultural values which accrue from the perusal of the great imaginative literature of the race, Lowell says:

''To wash down the drier morsels that every library must necessarily offer at its board, let there be plenty of imaginative literature, and let its range be not too narrow to stretch from Dante to the elder Dumas. The world of the imagination is not the

world of abstraction and nonentity, as some conceive, but a world formed out of chaos by a sense of the beauty that is in man and the earth on which he dwells. It is the realm of Might-be, our haven of refuge from the shortcomings and disillusions of life. It is, to quote Spenser, who knew it well,— "'The world's sweet inn from care and wearisome turmoil.' Do we believe, then, that God gave us in mockery this splendid faculty of sympathy with things that are a joy forever? For my part, I believe that the love and study of works of imagination is of practical utility in a country so profoundly material (or, as we like to call it, practical) in its leading tendencies as ours. The hunger after purely intellectual delights, the content with ideal possessions, cannot but be good for us in maintaining a wholesome balance of the character and of the faculties. I for one shall never be persuaded that Shakespeare left a less useful legacy to his countrymen than Watt. We hold all the deepest, all the highest, satisfactions of life as tenants of imagination. Nature will keep up the supply of what are called hard-headed people without our help, and, if it come to that, there are other as good uses for heads as at the end of battering-rams.

"But have you ever rightly considered what the mere ability to read means? That it is the key

which admits us to the whole world of thought and fancy and imagination? to the company of saint and sage, of the wisest and wittiest at their wisest and wittiest moments? That it enables us to see with the keenest eyes, hear with the finest ears, and listen to the sweetest voices of all time? More than that, it annihilates time and space for us; it revives for us without a miracle the Age of Wonder, endowing us with the shoes of swiftness and the cap of darkness, so that we walk invisible like fern-seed, and witness unharmed the plague of Athens or Florence or London; accompany Cæsar on his marches, or look in on Catiline in council with his fellow-conspirators, or Guy Fawkes in the cellar of St. Stephen's. We often hear of people who will descend to any servility, submit to any insult, for the sake of getting themselves or their children into what is euphemistically called good society. Did it ever occur to them that there is a select society of all the centuries to which they and theirs can be admitted for the asking, a society, too, which will not involve them in ruinous expense, and still more ruinous waste of time and health and faculties?

"The riches of scholarship, the benignities of literature, defy fortune and outlive calamity. They are beyond the reach of thief or moth or rust. As

they cannot be inherited, so they cannot be alienated. But they may be shared, they may be distributed."

The Values of Poetry.—In this material, or so-called practical age, the culture to be derived from the reading of the best poetry should not be overlooked simply because its intangibility may defy the test-tube of the scientist and the measuring-rod of the practical man. The indefinable values of poetry are thus described by George Willis Cooke:

"Poetry enters into those higher regions of human experience concerning which no definite account can be given; where all words fail; about which all we know is to be obtained by hints, symbols, poetic figures, and imaginings. Poetry is truer and more helpful than prose, because it penetrates those regions of feeling, beauty, and spiritual reality, where definitions have no place or justification. There would be no poetry if life were limited to what we can understand; nor would there be any religion. Indeed, the joy, the beauty, and the promise of life would all be gone if there were nothing which reaches beyond our powers of definition. The mystery of existence makes the grandeur and worth of man's nature, as it makes for him his poetry and his religion. Poetry suggests, hints, images forth, what is too wonderful, too transcendent, too near primal reality, too full of life, beauty, and joy, for ex-

planation or comprehension. It embodies man's longing after the Eternal One, expresses his sense of the deep mystery of Being, voices his soul sorrow, illumines his path with hope and objects of beauty. Man's aspiration, his sense of imperfection, his yearning for a sustaining truth and reality, as the life within and over all things, find expression in poetry; because it offers the fittest medium of interpretation for these higher movements of soul. Whenever the soul feels deeply, or is stirred by a great thought, the poetic form of utterance at once becomes the most natural and desirable for its loving and faithful interpretation."[1]

This brief exposition of the cultural value of reading the best literature in prose or poetry may be concluded with Wordsworth's striking characterization of the value of books:

> "Books, we know,
> Are a substantial world, both pure and good;
> Round these, with tendrils strong as flesh and blood,
> Our pastime and our happiness will grow."

If pupils secured a vivid realization of the treasures of information, truth, beauty, and inspiration, which are locked up within the printed symbols of books, their appetites for good reading would be

[1] G. W. Cooke, *Poets and Problems*, pp. 31–32.

whetted. Their determination to secure a mastery of reading, the indispensable key to those priceless treasures, would be aroused. Their enthusiastic, whole-hearted efforts would be enlisted in the great enterprise of developing efficient habits of reading. The teaching of reading would be transformed from an irksome task into an exciting enterprise, enlisting the elements of treasure-seeking and adventure.

The Practical Value of Reading

Its Fundamental Importance as a Tool Subject.—Among the various subjects in the elementary school curriculum, reading occupies the position of fundamental importance. It constitutes the basic tool through the medium of which the other subjects are mastered. Consequently if the interpretation of the printed symbols is halting and defective, the approach to the other subjects is seriously impaired; while effectiveness in reading furnishes a powerful aid in securing a mastery of them. This is particularly true of the schools in the United States where the recitation is commonly based on a textbook assignment, by the reading of which pupils are usually expected to learn the lesson. In Europe, oral exposition by the teacher is the principal method

of instruction and the textbook is less prominent. Nevertheless even in the schools of the Old World, effectiveness in reading is essential to independent study and scholastic efficiency.

Table 1

The Portion of Each Thousand Dollars Spent for the Teaching of Reading in Each of the First Six Grades as Compared with its Nearest Competitors

Subjects	First grade	Second grade	Third grade	Fourth grade	Fifth grade	Sixth grade	Average per grade
Reading	611	407	307	240	150	156	312
Arithmetic	5	101	176	187	181	190	140
Language	95	110	126	130	178	105	124
Music	86	90	84	67	58	67	75
Spelling	3	92	90	93	80	71	71
Geography			9	102	124	152	64

The Amount of Money Spent for the Teaching of Reading Compared with Other School Subjects.— Holmes in a recent study has shown that more than one-fourth of the total time in the elementary school is devoted to the teaching of reading. Indeed, in the primary grades little else beyond the interpretation of the printed symbols is attempted. A larger share of the school funds is employed for the teaching of reading than for any other subject. In an investigation of the relative amount of money spent

on the teaching of the various subjects in the first six grades in the elementary school of Hibbing,

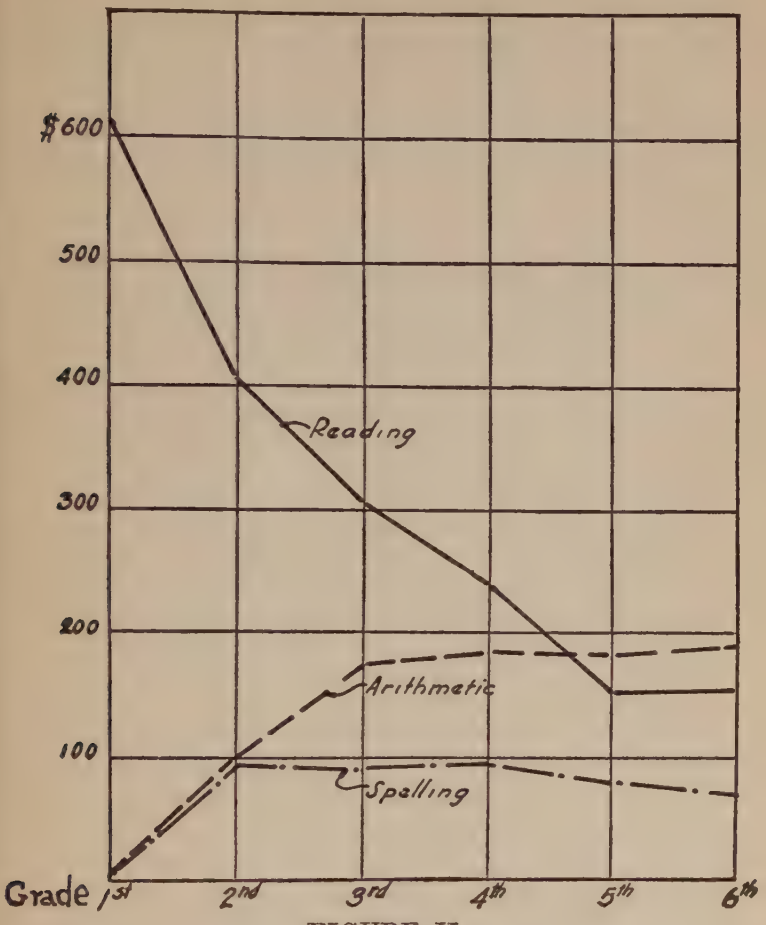

FIGURE II

THE RESPECTIVE COSTS OF TEACHING READING, ARITHMETIC AND SPELLING

Minn., Fleming, in an unpublished study,[2] found that reading consumed approximately two-thirds of the total expenditure in the first grade, while its average cost per grade for the first six grades was more than the combined cost of any other two subjects. The expenditure for reading as compared with its nearest rivals is shown in Table 1 and Figure 2.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. How ancient is writing and reading in Egypt according to recent investigations? How many thousand years ago was writing in Egypt passing beyond the pictograph stage into the alphabetic, according to Clodd?

2. What element of interest does a knowledge of the origin of the alphabet throw upon the task of learning to read?

3. What is the pictograph stage in the evolution of writing?

4. To what does Hirn trace the origin of pictorial art?

5. How does the ideograph differ from the pictograph?

6. To meet what exigency were phonograms invented?

7. What discovery led from the rebus-phonogram to the alphabet?

8. What are the main cultural values of reading imaginative literature? Of poetry? What other cultural values can you formulate besides those mentioned in the text?

9. What are the practical values of reading? Describe the causal relationship between efficiency in reading and efficiency in the other subjects.

[2] G. L. Fleming, *Instructional Costs in the First Six Elementary Grades.* Master's Thesis, Department of Education, The University of Chicago, 1916.

10. What proportion of the total time in the elementary school is devoted to reading? What proportion of the funds?

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CHAPTER II

COMPARISON OF SILENT AND ORAL READING

In the past, reading as a subject in the elementary school curriculum has generally meant oral reading. The effort of the teacher has been to secure distinct articulation, correct pronunciation and appropriate modulations of the voice. When these elements were obtained, the teacher of reading generally felt satisfied that her task was completed. The pupils had learned to read, in the sense that they had learned to articulate distinctly and to vocalize in accordance with the rules of the rhetorician.

Within the past decade or two careful scientific research into the psychophysical nature of the reading process, followed by painstaking analysis and sifting of reading values, has revealed another side of the story—a side that had long been overlooked. Besides reading in the sense of oral exhibition, there was disclosed another and a different type, namely, the silent interpretation of the printed symbols with distinct values as well as distinct types of eye movement habits. Scientific investigations of these two forms reveal likewise the existence of characteristic

differences in both rate and comprehension. They render the drawing of a clear line of demarcation between oral and silent reading imperative.

In order that the arrangement of the course in reading may not be lopsided but may reflect the findings of educational research, and that the emphasis may be placed where it is most needed and will bring the richest returns, it will be helpful to epitomize the chief results of recent investigations showing the characteristic differences between oral and silent reading.

Comparison of Rate in Silent and Oral Reading.—Back in 1913, Pintner investigated the silent and the oral reading of twenty-three pupils in the fourth grade, and discovered that when reading silently they averaged eight lines more per minute—a superiority of forty percent over their oral rate. In 1914, Superintendent Oberholtzer in an investigation of the silent and oral reading rate of 1800 children in grades three to eight, found a superiority in each grade in favor of the silent reading rate. The results as shown in Table 2 disclose a gradual increase in the superiority, starting with 0.2 more words per second in the third grade, until in the eighth grade it reaches approximately one complete word more per second when reading silently than when reading orally.

Table 2

Speed in oral and silent reading (After Oberholtzer)

Grade	Words read per second	
	Oral	Silent
3	2.1	2.3
4	2.3	2.6
5	2.4	3.1
6	2.8	3.9
7	3.1	4.7
8	3.9	4.8

In an investigation of 112 pupils in five classes in the sixth grade, Mead in 1915 as a result of six tests found that silent reading yielded a markedly superior average in speed as shown in Table 3.

Table 3

Relative ability in silent and oral reading (After Mead)

	Average number of lines read	Average number of points reproduced	Per cent reproduced of amount read
Silent reading	39.4	16.4	38.7
Oral reading	33.6	12.1	32.9

As a consequence of his investigation, Mead concludes: "From the results of these five classes we are more convinced than ever that our schools devote

altogether too much time to oral reading and too little to silent."

In a study of the Cleveland schools in 1916, Judd found that in every grade from the second to the eighth in forty-four different schools, the rate of silent reading was faster than the oral rate. Indeed every scientific investigation of this problem has demonstrated the conspicuous superiority of silent over oral reading in rate.

This is but the conclusion which even an *a priori* study of the situation would lead one to expect. For oral reading, involving the movement of the elaborate musculature of articulation, the tongue, lips, palate, vocal cords, larynx, and throat, is retarded by the slow cumbrous character of these accompaniments.

In a subsequent chapter photographic records of the eye movement and eye pauses occurring during the act of reading will be presented. These photographs will reveal the physiological basis of the superior speed in silent reading by disclosing the greater number of eye fixation pauses necessitated in oral reading.

Comparison of Comprehension in Silent and Oral Reading.—While the question of rate was scarcely ever raised in the teaching of reading in the past,

the general conception was that oral reading yielded more thorough interpretation of the passage than silent reading and thus afforded superior comprehension. In cases where pupils would find certain passages in their reading assignments difficult to grasp, it was not an uncommon practice for teachers to counsel the pupils to read the matter aloud to themselves that the meaning might thus become clear to them. Is oral reading, however, really conducive to better comprehension than silent reading? The results of numerous investigations wherein the comprehension was measured by scientific standardized tests, not only give a negative answer to this query, but demonstrate the marked superiority of the comprehension in silent reading.

The results of Mead's study, as summarized in Table 3, show that the pupils, when reading silently, reproduced not only a greater absolute number of points, but even a greater relative number, or a greater percentage of points than when reading orally. The pupils tested by Pintner likewise registered a greater percentage of points reproduced in their silent than in their oral reading.

Following their joint investigation of this problem in 1916, Pintner and Gilliland concluded that "the silent reading of the adult is quicker than the oral

reading and at the same time the number of ideas remembered is slightly greater, certainly much greater per unit of time."

The greater slowness of oral reading secures a greater expenditure of time upon a passage, but this is more than counteracted by the division of attention, which is placed upon the correct articulation and modulation of the voice and is thereby withdrawn to an appreciable extent from the mastery of the thought content. The findings of modern scientific research as well as the results of careful psychological analysis may be thus epitomized: *Silent reading is, as a rule, a more economical and effective instrument for the assimilation of the thought of a passage than oral reading.*

Values of Oral Reading.—Yet oral reading has its values. This is true particularly in the primary grades. The pupil comes to school with a vocabulary that is entirely oral. The problem of learning to read is reducible to the task of associating the familiar auditory symbol, the sound of the word, with the unfamiliar visual symbol, the printed word. Reading in the primary grades is, therefore, radically different from reading in the upper grades. Instead of extracting meanings from printed words, reading in the primary grades is chiefly concerned with attaching meanings to these visual symbols.

Consequently, oral reading in the primary grades is indispensable.

Furthermore, oral reading is helpful in the formation of habits of distinct articulation and correct pronunciation, and in the proper use of the voice. Certain types of literature such as poetry, wherein the values are distinctly auditory, can be fully appreciated only in oral reading.

The St. Louis *Course of Study in Reading* credits to oral reading the following rather subtle social value: "There are elements of inspiration in community of attention; there is a peculiar intensity in community of interest; new facts are added to the individual's insight by his being a part of a new mind-of-the-group. To both the reader and the reading audience a fuller conception of meaning results from the coöperation of the eye and the ear.

"An incalculable value, from the standpoint of social adjustment and constructive social progress, accrues to the group from any series of common experiences, especially those that enlarge the area of mutual understanding and sympathy, and that tend to establish a general acceptance of common standards of quality in thought and motive. The opportunity for intimate participation that is afforded to a class in reading meetings may therefore be made to serve a significant social purpose,

for the group and for every individual in it, in strengthening their sense of harmony and interrelation of thought and feeling—an essential factor of democracy."

The question may be raised, however, whether the social value mentioned inheres any more in oral reading than it does in any of the activities of the student group if properly managed. Silent reading, class recitation, theme work, etc., may all be made to yield a social value in the form of an enlargement of the area of common experiences.

The plain facts are that after the pupil emerges from the primary grades with a mastery of the mechanics of reading and word pronunciation, and possessing the essential equipment for the unlocking of the printed symbols, the need for the continuance of the same amount of drill in oral reading is decidedly lessened. To be sure, distinct articulation, accurate pronunciation and the appropriate modulation of the voice still remain values. But vocalization and word pronunciation should not be confused with reading. The latter is a distinct process, consisting essentially in the gathering of the thought from the printed symbols. If this be lacking, no amount of vocalizing or oral exhibition—though it may conceal the lack—can substitute for the absence of the thought mastery.

Values of Silent Reading.—In the grades above the primary, silent reading is superior to oral in both speed and comprehension. It has now become for the pupil the more economical and effective tool for the interpretation of printed symbols and the gaining of knowledge. Furthermore, the exigencies of his school work, as well as of his life outside of school, require him to use it to a constantly increasing degree. His history, geography, newspaper, magazine, story book, are all read silently. He now reads for the thought, not for the purposes of oral exhibition or the entertainment of others. He is interested now, not in the external mechanics of reading, but in the thought content. In fact, if the teacher of a sixth grade class will stop and ask the members to enumerate the situations outside of the reading class, in which they had occasion to read orally in the course of any past month, she will be apt to discover how conspicuous they are by their absence. Yet in probably the majority of schools, reading in all the grades, by a curious lack of adjustment, still remains of the dominantly oral type, while training in silent reading, in the type of reading that the pupil uses every day of his life, is strangely absent.

Exclusive Teaching of Oral Reading—an Anachronism.—What is the explanation of this situa-

tion wherein oral reading—so seldom employed outside of the formal reading period—dominates the curriculum to the almost utter exclusion of training in silent reading? The answer is probably twofold. First, the demonstration of the superiority of silent reading in both rate and comprehension through the agency chiefly of standardized tests has been of comparatively recent date. Secondly, elaborately worked-out methods in oral reading have long been available to the teacher, while methods of training in silent reading are now just being developed.

Viewed in the light of its historical genesis, the teaching of reading as an oral subject has come down into the present curriculum as a heritage from the ancient days when oratory, speech, and vocal instructions were not only the most important but almost the only instruments for the dissemination of thought and knowledge. Before the invention of printing, manuscripts, involving, as they did, so much and such tedious labor, were necessarily extremely few in comparison with the products of the present-day press, and could not constitute the important medium of instruction which books do now. While printing has revolutionized the condition for the spread of ideas and the general means of education, yet the school under the sway of custom and tradition has preserved almost intact the curriculum

of reading of the centuries past, with its sole stress upon oral exhibition, in spite of the fact that the objective conditions of life for which that curriculum was constructed now no longer exist. The subject of reading, like all other branches of the curriculum, tends, with the lapse of time, to become petrified—a fossil of ancient practices—unless it is subjected to constant revision, modification, and adaptation to meet the corresponding changes in the objective conditions of modern life. The need of a readjustment, of a substantial shift of emphasis in this portion of the school's curriculum, to meet the changed external conditions of the modern world is both obvious and urgently imperative.

Evil Effects of Overemphasis on Oral Reading.—The neglect of silent reading and the emphasis upon oral reading throughout the entire eight grades of the elementary school, tend to build up fixed habits of word pronunciation and articulation of the slow, plodding character which many investigators allege are almost ruinous to the formation of the opposite habits of rapid, effective silent reading of the meaningful type. After an exhaustive study of the present status of reading in our schools, Judd comes to the following conclusion: "Many a pupil leaves school equipped with the mechanical ability to read words, but utterly unacquainted with the possibility

of interpretation. School reading has been a formal ceremony for the pupil. He has formed the habit of thinking that the words have been adequately dealt with when they have been sounded. The fault is with the school's selection of reading matter and with the school's emphasis on mere mechanical perfection in oral reading. . . . The present practice of continuing drills in the mechanics of reading through the elementary school undoubtedly retards pupils rather than helps them."

Following a detailed analysis of the errors made by children concerning the matter they have just read, Thorndike reaches a similar conclusion: "In school practice it appears likely that exercises in silent reading to find the answers to given questions, or to give a summary of the matter read, or to list the questions which it answers should in large measure replace oral reading. The vice of the poor reader is to say the words to himself without actively making judgments concerning what they reveal. Reading aloud or listening to one reading aloud may leave this vice unaltered or even encouraged. Perhaps it is in their outside reading of stories and in their study of geography, history, and the like, that many children really learn to read."

Moreover, the habits of slow mechanical reading, resulting from a grossly misplaced emphasis and

from defective methods of teaching, last not only during the pupil's school career, but tend to persist till his dying day. Undoubtedly many a reader need go no farther than his own case to find a concrete illustration of the following generalization made by Huey: "Doubtless many of us dawdle along in our reading at a plodding pace which was set and hardened in the days of listless poring over uninteresting tasks or in imitation of the slow reading aloud which was so usually going on either with ourselves or with others in the school."

Shift Emphasis from Oral to Silent Reading.—The findings of all scientific investigators of this problem converge upon the necessity of shifting some of the emphasis from oral to silent reading. Not that oral reading, word pronunciation and phonic analysis are to be neglected—for the pendulum must not swing to the opposite extreme—but that some effort must be made to train the pupils in that kind of reading which the exigencies of modern life require them to use daily, the effective silent unlocking of the printed keys to thought and meaning. As a consequence of their investigations of the comparative efficiency of the oral and silent reading of the pupils in the elementary schools, in the high school, and in the college, Pintner and Gilliland draw the following significant conclusion: "Thus it would

appear that silent reading is undoubtedly the more economical besides being the method best adapted to the ordinary activities of life, since the vast majority of our reading is silent. This being the case, we are forced to raise the pedagogical question, and ask why it is that so much more attention is given to oral reading than to silent reading in our schools."

Probably no student of modern education has brought out more strongly or convincingly the pressing need for a radical shift of emphasis from oral to silent reading than has Judd, who concludes: "Enough [evidence] has been brought together to make it certain that in the middle grades there is a change in relation between oral language and reading which ought to be recognized by a radical change in methods of instruction. Oral reading should give way to silent reading and phonic analysis should give place to word analysis. Meanings should be emphasized and not the mechanical pronunciation of words.

"Many schools have not recognized the demand for a new type of instruction in reading from the fourth grade on and as a result have seriously injured the development of pupils. . . . The oral methods which are legitimate in the lower grades become inappropriate with the growth in fluency and range of recognition. . . . It is a mistake to

jeopardize the child's independent, fluent, silent reading in the fourth grade by insisting during this period on the usual oral exercises. . . . The conscientious teacher supplied with a reading book and a period in the program carries on the well-known reading farce in the vain hope that the effects of unsuccessful teaching will be overcome by a liberal application of the same methods that produced the difficulties.

"Teachers ought to recognize with clearness the fact that in the upper grades silent reading is the really useful type of reading. They ought to understand that pupils outgrow oral training just as infants outgrow creeping when they learn to stand up and walk."

The conclusion reached by Judd may be said to reflect the consensus of opinion of all the investigators and careful students on this subject.

The Psychology of Reading

In its broadest sense, reading may be said to be the interpretation of any visual or tactual symbols. In its stricter significance it is the perception and interpretation of written or printed language. The act of reading consists of two main psychophysical processes: (1) The ocular adjustments necessary

to perceive the words as visual symbols, and (2) the arousal of the mental associations necessary to give meaning to the visual symbols. Both of the processes are in reality complex ones, and embrace many steps, so that the total reading act may be further analyzed into its constituent detailed processes.

Starch [1] enumerates the following nine steps:

1. Reception upon the retina of the stimuli from the printed page.
2. The range of the field of distinct vision on the retina.
3. The range of attention in apprehending visual stimuli.
4. The movement of the eyes.
5. The transmission of the visual impressions from the retina to the visual centers of the brain.
6. The establishment or arousal of association processes whereby the incoming impulses are interpreted.
7. The transmission of the impulses from the visual centers to the motor speech centers.
8. The transmission of motor impulses from the speech centers to the muscles of the vocal cords, tongue, lips, and related parts.
9. Execution of the movements of the speech organs in speaking the words.

It is obvious that these steps are not entirely consecutive; some of them coalesce. Many of them are complex and might be further analyzed into their psychophysical components. They serve, however, to indicate the chief steps in the reading process,

[1] Daniel Starch, *Educational Psychology*, p. 260, The Macmillan Co., 1921.

which is otherwise apt to be considered by the ordinary reader as a single unitary action. In the case of silent reading only the first six steps occur, except in so far as incipient inner speech accompanies the reading, entailing the three latter processes in an abbreviated and vestigial form.

The Psychology of Meanings.—While experimental research into the number and length of eye movements, the duration of the fixation pause, and the general motor behavior of the eyes has cast a helpful light upon the reading act, it is needless to say that the fundamental and crucial processes are the intangible ones which lie back of the eye-movements and fixations. How are the perceived visual symbols interpreted by the mind? How do meanings arise after the ocular adjustments have been completed?

The psychology of a generation ago had a very simple, naïve explanation. The mind was conceived as a storehouse of images or pictures of objects and occurrences in the outside world. The sight of the word simply aroused the visual image of the object or event and the meaning was thereby secured.

Careful investigation has cast the old traditional explanation into the discard, by demonstrating the frequent absence of visual imagery in the reading of many persons, and their grasping of the meaning of the passage without the intercessory aid of pic-

torial imagery. Instead of viewing the mind as a mere storehouse of memory images, modern psychology sees it as a dynamic, organized personality reacting to the stimuli of the external world. The essential element in the interpretation of a word is, therefore, the phase of the individual's experience connected therewith, or his associative reactions. This fact is thus illustrated by Judd:[2] "When I see food I do not merely receive in the mind an impression or call up memory images; I am aroused to a form of vivid desire and of vigorous reaction. My experience corresponds to the tendencies toward reaction which are aroused in me more than to the image which I have in mind. Indeed, I may not look at the food in a way to see it in very great detail; I may be vague about what it is that appeals to my hunger, and yet I may have a very vivid consciousness of desire corresponding to the fact that I eagerly reach for food. Thus with many of our experiences, especially those which have to do with our most urgent and fundamental needs, there is little emphasis on the picture in the mind and great emphasis on our reactions."

The reactions to the stimuli of the external world in the form of objects or events are gradually carried

[2] C. H. Judd, *Reading: Its Nature and Development*. Supplementary Educational Monographs, Vol. II, No. 4, July, 1918, University of Chicago Press.

over to the words themselves, so that the perception of the words immediately arouse the corresponding reactions. Most persons experience a recoil reaction from a snake. This same type of reaction becomes associated with the word "snake" so that the perception of the word immediately sets off the nascent recoil reaction without the intercessory agency of a visual image. This statement is further corroborated by the use of figures of speech which are means of carrying over attitudes rather than pictorial images. Thus, as Judd observes, the individual who expresses himself as having undergone a bitter experience really means that he has gone through the same disagreeable recoil which he feels when there is a bitter taste in his mouth. In this case bitter refers not to the taste, but to the attitude caused by the aroused nascent reactions.

The Function of Pictures.—The particular function which pictures perform when used to assist the beginner to attach meaning to words is apt to be misunderstood. A teacher may hold up a picture of an apple before her pupils, and write the word "apple" on the blackboard before them. The ordinary conception of the purpose of this action is that it serves to stamp a vivid pictorial image upon the mind. But whether the teacher knows it or not, the psychological process which really occurs is

substantially this: The picture of the apple arouses the interest, reactions and experiences which the pupil has thus far had with apples. The writing of the word on the board at the same time serves to carry over to it all the awakened experiences and vivid reactions of the pupil, who has handled, tasted, chewed and played with apples at various previous times. The word "apple" has thus become a dynamic symbol charged with vital interest and clothed with interpretative experience. It is only because pictures serve to arouse vivid interest, personal reactions, and carry this awakened experience over to the words themselves that they are of assistance to the beginner in learning to read.

On the psychology of interpretation, perhaps no one has written with greater penetration than Judd, who says: "Whether the teacher uses the picture or the spoken word, the real purpose of the exercise is to attach to the printed word an interpreting attitude. The more vivid the experience used, the more vivid will be the reaction and the more complex the interpretation attached to the printed word. It is well, therefore, that a teacher should use pictures and objects, but in trying to understand what goes on in the pupil's experience the teacher should understand that the concrete object is in itself a

subject of interpretation through the reactions which attach to it."

Material Should Be Within the Scope of the Child's Experience.—From this analysis of the psychological processes of interpreting printed symbols there flow two corollaries of practical pedagogical importance. First, since reading in the primary grades is not so much a matter of extracting meaning from the printed symbols as it is of attaching meaning to them, it follows that the content of the primary readers should be well within the pale of the child's experience. Otherwise there will be lacking the aroused nascent reactions which are necessary to accompany the printed words to give them meaning. Where this associative experience is lacking, the only response which results is the mechanical reaction of the articulatory muscles. The printed word still remains barren, meaningless, unclothed with personal interest or the associative experience necessary to give it meaning. Where much of the material in primary readers is of this unfamiliar type, beyond the reach of the child's interest and experience, there results that dull, mechanical, parrot-like kind of reading which might better be termed empty vocalization. Horace Mann amply described it as "a barren action of the organs of speech on the atmos-

phere" instead of "an exercise of the mind in thinking and feeling."

In the report of Horace Mann to the board of education of Massachusetts in 1838, made after a careful and extensive investigation of the reading of the grade school pupils, he penned the following indictment of the then prevalent teaching of reading. The result of the formal mechanical reading at that time in vogue was "that more than eleven-twelfths of all the children in the reading-classes, in our schools, do not understand the meaning of the words they read; that they do not master the sense of the reading-lessons and that the idea and feelings intended by the author to be conveyed to, and excited in, the reader's mind, still rest in the author's intention, never having yet reached the place of their destination. And by this it is not meant that the scholars do not obtain such a full comprehension of the subject of the reading lessons, its various relations and bearings, as a scientific or erudite reader would do, but that they do not acquire a reasonable and practical understanding of them. It would hardly seem that the combined efforts of all persons engaged could have accomplished more in defeating the true objects of reading."

The light cast upon the nature of the reading act by the huge volume of painstaking psychological

research, both of the introspective and of the laboratory type, since the days of Horace Mann has disclosed more clearly the various psychophysical steps in the reading process, and has resulted in a conspicuous refinement of the technique in the teaching of reading, but that the kind of meaningless mechanical reading so prevalent in the days of Horace Mann, and so strongly condemned by him, has by no means completely disappeared from our present-day classrooms, the experience of teachers and supervisors of reading will abundantly testify.

Material Should Appeal to Child's Interest.—The second corollary of practical pedagogical consequence flowing from the psychological analysis of the interpretation of printed symbols is this: Those words which awaken not only the child's experience, but which arouse also his deep, personal, vivid interest will be found to be the easiest to interpret. While interest is not the same indispensable requisite for interpretation that experience is, it is the element which renders the interpretation easy, pleasant and rapid. Dull, uninteresting objects in the child's environment may be used in teaching the pupil to read, but the slowness and the effort required is in marked contrast with the rapidity and the facility of the reading when the story appeals strongly to the spontaneous interests of the child. The more deeply

and vividly the material is surcharged with interest, the more strongly will the personal reactions be aroused and the richer will be the experience necessary for the interpretation of the printed symbols. That is why recent primary books display a wise preference not only for the concrete but for those elements within the concrete which are rich in vital, vivid, dynamic interest and thereby enlist the spontaneous interest of the child's mind in gaining the mastery of the printed page. That is also why the older primary readers with their lessons about such disconnected objects as man, fan, cat, ball, house, wall, etc., completely lacking in story plot, are yielding before the newer type of readers whose material is built into story plots and is rich in dramatic values for the child.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. What are the differences in rate between silent and oral reading in the various grades, from the third to the eighth? What are the conclusions reached by Pintner? Oberholtzer? Mead? Judd?

2. How does the comprehension in silent reading compare with that in oral reading? What explanation can you offer for the difference?

3. Compare the values of oral and silent reading. Have each member of the class count the occasions outside of school in which he has used oral reading during the past week. Will

they average two per student? Do the same for silent reading. Contrast the averages.

4. Why is the exclusive teaching of oral reading an anachronism? What are the chief causes of the dominance of oral reading in the curriculum?

5. Trace the changes in the objective conditions of life, and in the transmission of knowledge which have occurred since the invention of printing. How should the school curriculum for reading reflect these changed conditions?

6. What are the evil effects of the overemphasis in oral reading?

7. Why should the emphasis be shifted from oral to silent reading?

8. Outline nine steps in the psychophysical process of reading.

9. How do meanings of written symbols arise in consciousness?

10. What is the function of pictures in the interpretation of printed symbols?

11. Contrast the mental phase of reading in the primary grades with that in the upper grades. In what respect is it the reverse of the other?

12. Why should reading material in the primary grades be within the scope of the child's experience? Why should it appeal to his interest?

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CHAPTER III

THE PHYSIOLOGICAL BASIS OF READING

Upon few phases of modern education have so many painstaking scientific investigations been focused as upon the physiological basis of reading. The researches of Javal, Erdmann and Dodge, Huey, Quantz, Dearborn, and more recently of Judd, C. T. Gray, Schmidt, W. S. Gray, Buswell, and others, have thrown considerable light upon both the neurological and the psychological elements of the reading complex. In the light of these findings the old traditional and still popular conception of reading as an act of perception occurring as the eyes move steadily and uninterruptedly along the printed line, has been discarded. The investigations of modern psychologists have demonstrated that instead of a regular passage of the eyes along the line, the movement consists of a series of pauses and jerks. The overwhelming weight of evidence indicates that it is only during the pauses that the eye really perceives, as the velocity with which it moves from fixation-pause to fixation-pause is so great as to cause a fusion of stimuli. This means that so far

as the purposes of clear perception are concerned, the eye is practically "blind" during the lightning-like sweeps from pause to pause.

During these pauses, the eyes fixate a certain portion of the line. Hence they are called "fixation-pauses." The movements from one fixation-pause to another are termed "inter-fixation movements." The swing of the eyes from the end of one line to the beginning of the next is usually referred to as the "return sweep." It is upon the fixation-pauses that psychologists have centered most of their investigations, for during these fixation-pauses the essence of the reading process seem to occur. According to the calculations of Erdmann and Dodge which have been generally confirmed, these pauses consume from twelve-thirteenths to twenty-three twenty-fourths of the entire reading time. Investigations have been particularly concerned in discovering the number of fixation-pauses made per line, their duration, and the order of their occurrence. These facts have been ascertained with scientific precision, chiefly because of the evolution of a technique for the photographing of the eye-movements.

Evolution of Technique for Photographing Eye-Movements.—In 1879 Javal, at the University of Paris, by placing a mirror before the eyes of a person reading, was the first to discover that the

passage of the eyes across a printed line was not a smooth, continuous movement, but was broken up into a series of pauses and jerks. It is difficult by that method to count the exact number of fixation-pauses while the precise duration of each pause remained unknown. Later investigators, such as Arens at the University of Rostock in 1891 and later on Delabarre at Harvard, fastened a small cup to the cornea of the eye and then endeavored by means of a rod, attached to the cup, to have the eye-movements recorded on a smoked drum. The uncomfortable pressure of a cup upon the eye, considerably disturbing the natural reading attitude, impaired to some extent the value of the records thus secured.

After considerable experimentation in directly photographing the eyes, Dodge at last succeeded in photographing "the movement of a bright vertical line as it was reflected from the cornea," thus securing reliable records of eye-movements under approximately natural conditions. Dearborn, Judd, Freeman, C. T. Gray, Schmidt and Buswell have contributed various refinements to the method, until at the present time both the number of fixation-pauses and their duration can be determined with remarkable accuracy. The method devised to secure such measurements is a typical illustration of the

remarkably ingenious technique which has been evolved in the effort to subject educational procedure to the same rigid, scientific mode of attack which obtains in the other sciences.

The eye-movements which will be shown in this study were photographed in the educational laboratory at the University of Chicago. The method consists in photographing a beam of light reflected from silvered glass mirrors into the cornea of the eye, and then reflected back from the cornea to a moving kinetoscope film. Each movement of the eye is reflected by a corresponding change in the pencil of light which is photographed upon the film. The time consumed in the reading processes is measured by an electrically driven tuning-fork, with a vibration rate of 50 per second. It is so arranged that the pencil of light is intercepted at each vibration, thus producing on the film a line of 50 dots per second. By counting these dots, the duration of the fixation-pauses, the inter-fixation movements, and the return sweeps can be accurately determined.

What Photographic Records Reveal.—The behavior of the eyes, while a fourth grade subject from a public school in Chicago was reading Gray's Silent Reading Test, is shown in Plate I. The large number of fixation-pauses per line, the excessive dura-

tion of some of them, and the number of regressive or backward movements, clearly reveal why the pupil is a slow, inefficient reader. Frequent regressive movements indicate that the meaning of the line was not at first thoroughly grasped, necessitating a return of the eye to some of the previous words in an

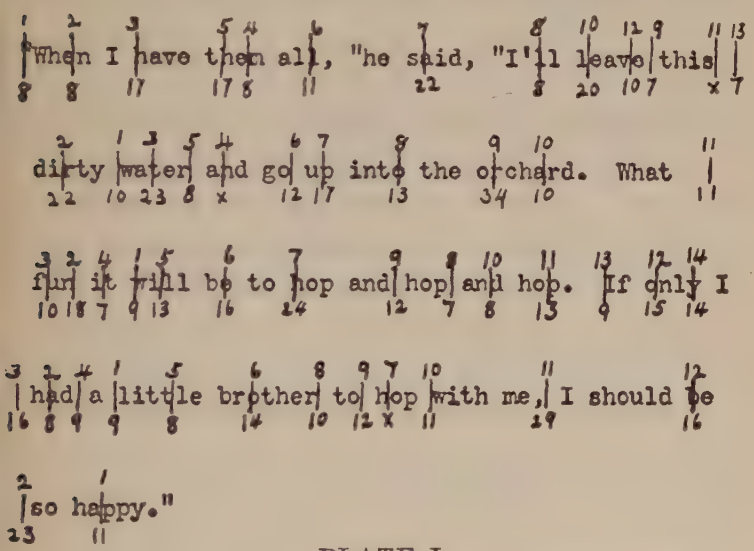

When I have them all, "he said, "I'll leave this
dirty water and go up into the orchard. What
fun it will be to hop and hop and hop. If only I
had a little brother to hop with me, I should be
so happy."

PLATE I

Silent Reading by a Fourth-Grade Pupil, before Training

effort to interpret the thought of the passage. Frequent backward movements not only retard the rate but generally reveal periods of mental confusion.

Contrast with this the record of the eye-movements of a rapid, efficient fifth grade reader from

a public school in Chicago, as shown in Plate II. The decrease in the number of fixation-pauses and

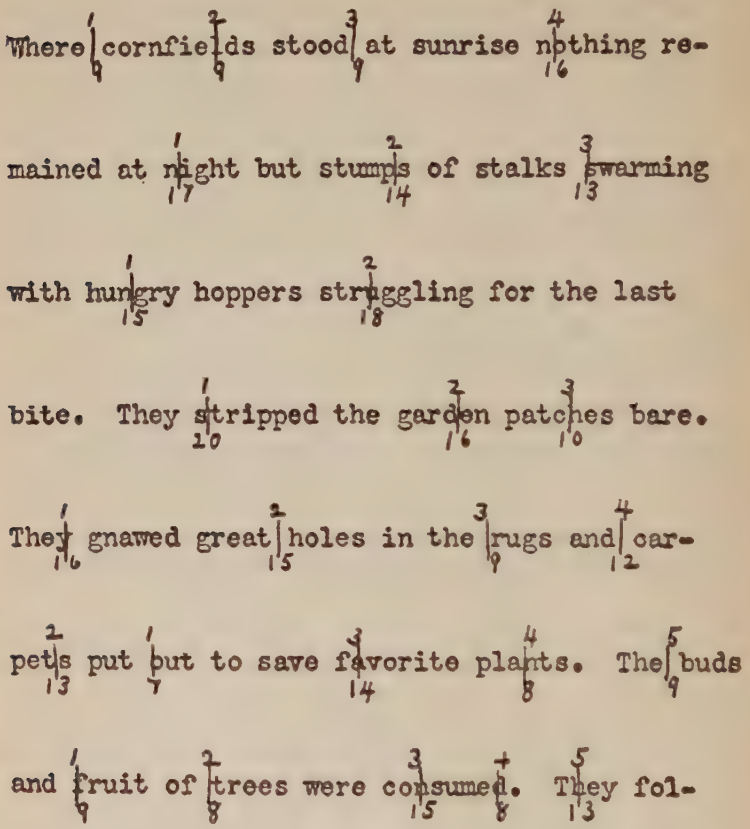

Where cornfields stood at sunrise nothing re-
mained at night but stumps of stalks swarming
with hungry hoppers struggling for the last
bite. They stripped the garden patches bare.
They gnawed great holes in the rugs and car-
pets put but to save favorite plants. The buds
and fruit of trees were consumed. They fol-

PLATE II

SILENT READING BY A FIFTH-GRADE PUPIL, AFTER TRAINING

in the number of regressive movements stands out strikingly. To read the first line in Plate I the sub-

ject required thirteen fixations, three of which occurred after regressive movements of the eyes.

In the second line there occurred eleven fixations with two regressive movements; in the third line fourteen fixations with three regressions. A large number of fixations per line reveal the narrow perceptual span of the reader who requires two fixations to grasp the short word "when" in the first line. The rather numerous regressive movements indicate that the subject experiences difficulty in mastering the relationship of the various words to the total meaning content of the passage. They are the outward reflex of the internal mental confusion.

In examining Plate II, one observes that the reading habits are of a markedly superior character. The first line is grasped in four fixations with no regressive movements; the second line in three fixations, while the mastery of the third line in but two fixations would seem to be an approximation to the upper physiological limit in the rapid perusal of printed matter. The only regressive movement in the passage of seven lines is found in the sixth line. The scarcity and almost complete absence of regressive movements reveal the rapid fluent mastery of the thought and the absence of mental confusion. The small number of fixations per line, the average being but 3.5 fixations per line, discloses the func-

tioning of a wide visual span which covers two, three, and even four words—as in the third line—in a single fixation pause.

A study of the occurrence of the fixations in each line reveals a balance, a swing, a rhythm to the eye-movements which is characteristic of a high degree of reading maturity. In the hierarchy of eye-movement habits which investigations have discovered, this Plate stands as an illustration of the highest and most efficient type. This record shows graphically the type of reading habits which a teacher should strive to develop in her pupils—habits characterized by a wide perceptual span and a regular rhythmical swing of the eyes free from regressive movements.

To secure a further measure of this subject's reading ability, the Courtis Silent Reading Test was administered. The results of this test serve as additional corroboration of the findings secured by the photographic method which analyzed the specific detailed factors in the efficient reading habits developed by the subject. His rate on the Courtis Test was found to be very rapid—395 words per minute. His index of comprehension was likewise very high—ninety-seven percent. Out of a possible total of seventy answers, he had sixty-six, of which only two were incorrect.

It is interesting to note that the subject whose eye-movements are recorded in Plate II is but nine years of age, though already in the fifth grade. In this rapid progress through the grades, his reading ability has undoubtedly been a powerful influencing factor. When asked for her observations concerning his reading habits, his teacher reported him as "fond of reading and reads extensively outside of school." When the photographic record of his eye-movements was being taken, the author noted the complete absence of lip movement.[1]

These two photographic records, as presented in Plates I and II, revealing the number of fixations per line, and hence the size of the perceptual span and the character of the eye-movements, both progressive and regressive, in a slow inefficient subject and in a rapid effective reader, will give the teacher some insight into the physiological basis of reading, and of the factors which, on the one hand, make for slowness and inefficiency, and of those, on the other hand, which are conducive to rapidity and effectiveness.

Physiological Basis of Difference Between Silent and Oral Reading.—The results of standardized

[1] For a complete statement of the method of procedure and the results obtained in this investigation, see: J. A. O'Brien, *Silent Reading*, The Macmillan Company, New York, 1921.

tests in grades above the primary, as previously stated, have demonstrated the marked superiority of silent over oral reading in both rate and comprehension. Silent reading is not only a faster method of gathering thought from the printed page, but it is a more effective one in point of comprehension. What is the physiological basis of such superiority? An answer may be secured from a study of the photographic records of the eye movements in oral and silent reading. The records disclose characteristic differences in the two types of reading. A greater number of fixation-pauses and hence a smaller perceptual span and a longer average duration of fixation-pause in oral reading, reveal the basis of its inferiority to silent reading in rate, while the greater number of regressive movements indicating periods of mental confusion, reveals the physiological basis of its inferiority in comprehension.

The photographic record of the eye-movements of an adult subject, a graduate student at the University of Illinois, in reading Gray's Silent Reading Test is shown in Plate III. Immediately after the subject had read the selection silently he was requested to read it orally. Because of the great advantage of familiarity with the passage as a result of just having read it, one might expect that the eye-

movements would be of a superior type, with fewer fixations and fewer regressive movements. The record of these eye-movements in the oral reading is

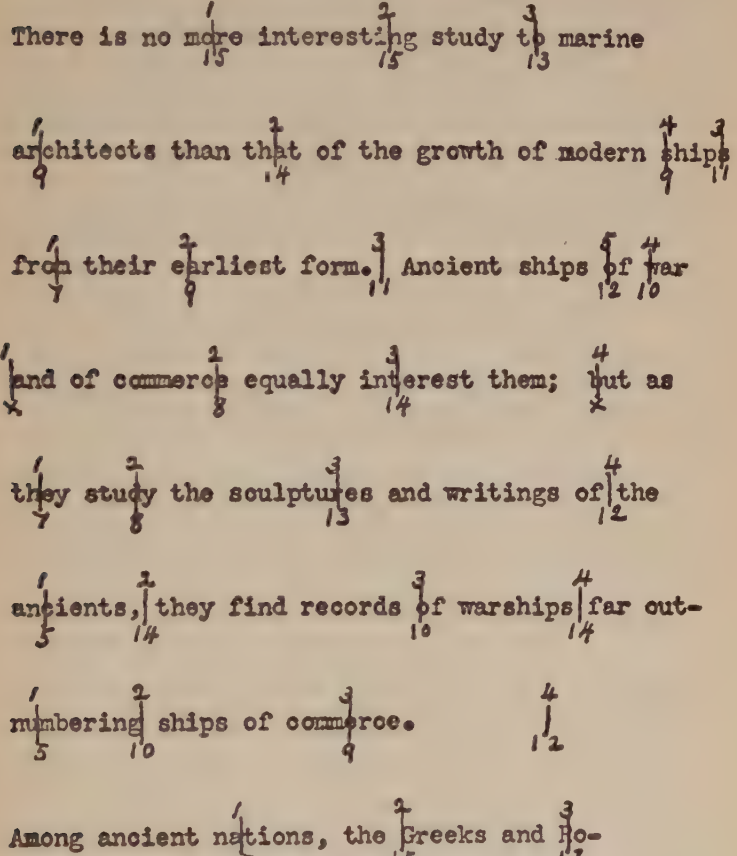
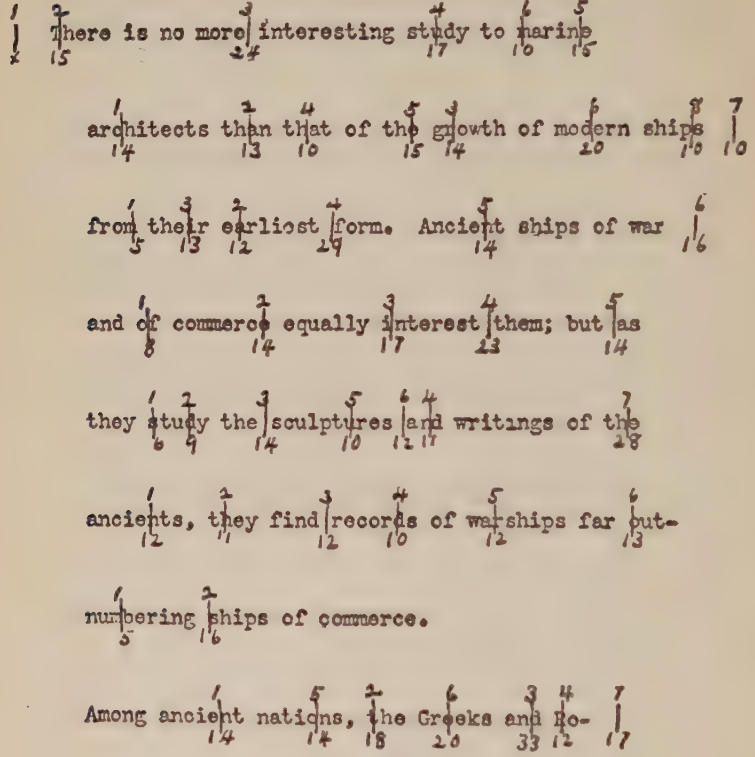

There is no more interesting study to marine
architects than that of the growth of modern ships
from their earliest form. Ancient ships of war
and of commerce equally interest them; but as
they study the sculptures and writings of the
ancients, they find records of warships far out-
numbering ships of commerce.
Among ancient nations, the Greeks and Ro-

PLATE III

SILENT READING BY AN ADULT SUBJECT

shown in Plate IV. A comparison of it with Plate III shows that the number of fixations and of regressive movements instead of decreasing have actually


There is no more interesting study to marine
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from their earliest form. Ancient ships of war
and of commerce equally interest them; but as
they study the sculptures and writings of the
ancients, they find records of war ships far out-
numbering ships of commerce.
Among ancient nations, the Greeks and Ro-

PLATE IV

ORAL READING BY AN ADULT SUBJECT

increased, while even the duration of the fixation-pauses has been prolonged.

Thus the first line was grasped in three fixations with no regressive movements by the silent reading method, while the rereading of this same line necessitated six fixations involving two regressive movements in the oral reading. The average number of fixations per line for the entire passage of thirteen lines rises from 4.3 in silent reading to 6.1 in oral reading, showing a marked narrowing of the perceptual span in oral reading. The average duration of the fixation-pauses jumps from 11.3 in silent reading to 14.6 in oral reading, showing that the perceptual process is forced to wait upon the slower process of vocalization. That the facility in grasping the meaning content was not so great by the oral reading method is shown by the mounting of the number of regressive movements for the whole passage from five in the silent reading to nine in the oral reading.

The uniformity of the ocular motor reaction habits is disturbed by the attempt to synchronize the perceptual process with the slower and more unwieldy process of articulation with the latter's dependence upon an elaborate physiological mechanism.

The advantage of the subject's greater familiarity with the passage is shown by the photographic records to be more than offset by the more cumbrous and awkward ocular motor reactions which oral

reading necessitates. The result of splitting the attention in oral reading, part upon the effort to pronounce the words correctly and to modulate the voice appropriately, and part upon the effort to interpret the meaning rather than the sound of the printed symbols, is reflected in the changed character of the eye-movement habits as illustrated in Plates III and IV. These plates are fairly typical of the differences in the eye-movement habits in oral and silent reading, which numerous investigations and many photographic records have shown to exist. They demonstrate the unmistakable superiority of silent over oral habits, namely, the wider perceptual span as shown in the smaller number of fixations, the shorter duration of fixation-pauses, the decrease in the number of regressive movements and the greater regularity and more rhythmical swing of the eye-movements. These constitute the physiological basis, on the ocular motor reaction side, of the marked superiority of silent over oral reading, both in point of time and energy expended.

THE EYE-VOICE SPAN IN READING

Recent researches have established the close interrelationship of silent and oral reading. Effective habits of eye-movements in silent reading seem to an

extent to carry over into oral reading, and to exercise upon the latter, a wholesome reflex influence. Evidence of this interrelationship has been presented in an interesting study of the eye-voice span in reading by G. T. Buswell. The experiment was conducted at the University of Chicago and the thesis containing the statement of the method of procedure and the results obtained was submitted for the Ph.D. degree at that institution in 1920.

In oral reading it has been found that the eye always moves in advance of the voice. The distance between the word which the eye is fixating and the word which the voice is uttering is called the eye-voice span in reading. In very immature readers, such as pupils in the first grade, the eye-voice span is at a minimum because the eye does not leave the word until it has been pronounced. Such reading is slow, halting, and more or less unintelligible, resembling the utterance of a number of disconnected words. As the pupil advances in maturity of reading, the eye-voice span increases. In pupils of moderate reading maturity, such as intermediate grade pupils, the eye frequently precedes the voice by a distance of ten or twelve letter-spaces or a difference of about two words. In mature readers the eye-voice span is considerably larger, reaching at times the distance of seven and eight words.

The reaching out of the eye ahead of the voice enables the reader to grasp the meaning of the coming words and phrases, hence read with intelligence and appropriate expression. The failure of the eye to read ahead of the voice is sometimes forcibly shown when a pupil, unaware of the approaching period, finds himself pronouncing the last word of the sentence with a rising inflection. Similar embarrassment occurs when words spelled alike but pronounced differently, such as "tear" (noun) and "tear" (verb), are encountered by a reader with no appreciable eye-voice span. The significance, therefore, of a wide eye-voice span in securing fluent intelligent expressive reading is obvious.

By a very ingenious device the dictaphone record of the oral reading was synchronized with the photographic record of the eye-movements. By this means it was possible to determine the word which the eye was fixating and the word which the voice was uttering at the same moment, thus establishing the eye-voice span at frequent intervals during the reading of a passage. The eye-voice span of 24 pupils, in grades second to seventh inclusive, of 24 from the high school, and of six college students was measured.

Good Readers Generally Have a Wide Eye-Voice Span.—In Plate V is shown the eye-voice span of

a good reader in the sixth grade. The record was taken while the subject was reading a paragraph from one of the Courtis Silent Reading Tests. The instructions given were to "read the paragraph naturally, just as you would a newspaper." The eye-voice span shown in the first line of this record is a conspicuously wide one, covering twenty letter-spaces of four words. By a "letter-space" is meant the space occupied by one letter or one punctuation mark or the blank space between the words. This is employed as the unit of measurement of the eye-voice span. The average number of letter-spaces per word is five. It will be noted that the eye-voice span occurring at the end of one line and the beginning of the next is usually not so wide as the eye-voice span at the beginning or middle of the line. But even here, in this record, it is seen to be sufficiently wide to provide the subject with a warning glimpse of the approaching period, thus enabling him to secure the proper inflection when the last word is vocalized. By the time the voice has reached "box," the last word in the sentence, the eye had already advanced over two words in the next sentence, thus telegraphing in due time the necessary warning to the voice of the ending of one sentence and the beginning of the next.

The average eye-voice span of this subject was

14.9 letter-spaces, which is approximately three full words. The rate of reading was 3.7 words per second. From the wide eye-voice span revealed in

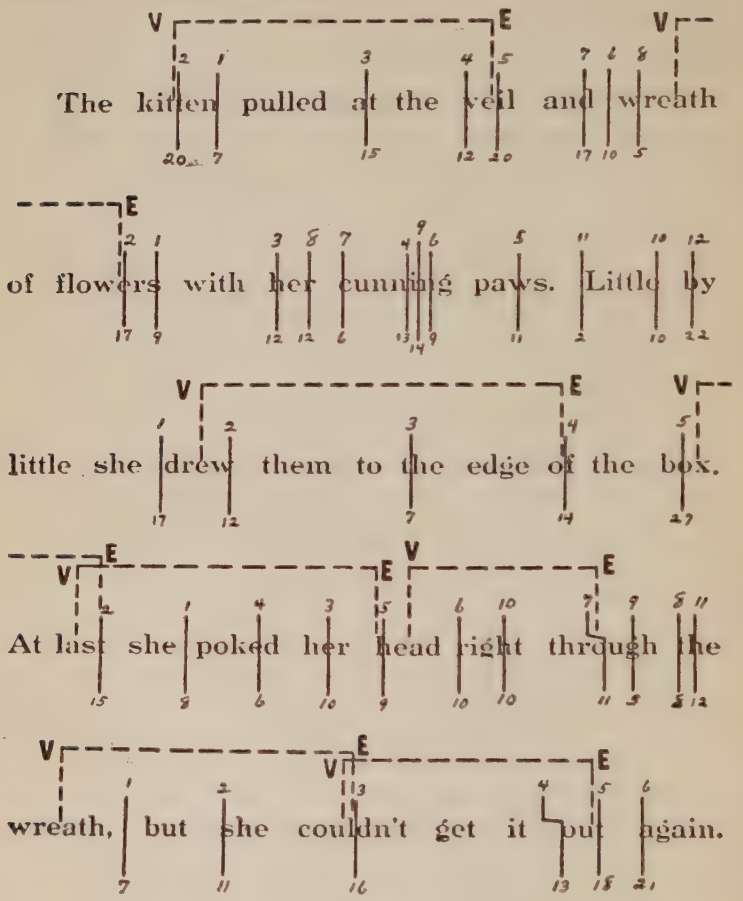
The kitten pulled at the veil and wreath
of flowers with her cunning paws. Little by
little she drew them to the edge of the box.
At last she poked her head right through the
wreath, but she couldn't get it out again.

PLATE V

EYE-VOICE SPAN OF A GOOD READER IN GRADE VI (FROM BUSWELL)

Plate V, it is easy to understand how the subject could read with that fair rate of speed and yet pronounce the words correctly and convey the sense of the passage with appropriate modulation of the voice and with intelligent expression. It is the wide eye-voice span that affords the opportunity of exploring the coming words and phrases and of grasping the meaning in larger units than single words, thus making it possible to give an effective oral presentation of the thought of the passage. A narrow eye-voice span would reduce the reading to the slow, halting, stumbling variety, that might with great propriety be termed "a calling of words."

Poor Readers Generally Have a Narrow Eye-Voice Span.—A striking contrast to the type of reading recorded in Plate V is shown in Plate VI. Thus in the first line it is noted that while the voice is pronouncing the word "kitten," the eye is still glued on the same word. In the fourth line the eye-voice span stretches over only three letter-spaces. The average eye-voice span of this subject for the entire passage is but 3.4 letter-spaces or less than a single word of average length. His rate of reading was but 0.3 words per second. Yet in spite of this slowness, his reading was very poor, almost entirely lacking in expression. With an eye-voice span so narrow, he was utterly unable to anticipate the

meaning of coming words or phrases, so that his reading became a stumbling calling of a series of words. The record of this subject is rather an extreme one. By contrast with the record in Plate V, it serves to bring out more strikingly, however, the differences in the effectiveness of oral presentation, resulting from differences in the width of the eye-voice spans of the readers.

Table 4

Average Eye-Voice Span by Grades—Elementary Subjects (From Buswell)

	Grade						Average for all grades
Subjects	II	III	IV	V	VI	VII	
Good readers	11.0	13.2	13.9	16.8	11.9	15.9	13.8
Poor readers	5.4	10.3	6.1	9.7	11.2	9.4	8.7
Good and poor	8.2	11.8	10.0	13.3	11.6	12.7	11.3

This table is read as follows: The average eye-voice span in grade II for good readers is 11.0 letter-spaces, for poor readers 5.4 and for good and poor readers combined 8.2 letter-spaces, etc.

In Table 4 is shown the average eye-voice span of 24 pupils in grades two to seven, inclusive. The average is shown for each grade, and also for the quality of reading within each grade. The average eye-voice span for the good readers in all the grades is 13.8 letter-spaces as compared with 8.7 for the poor readers. This average superiority of fifty-eight percent in width of eye-voice span for the good

readers makes it apparent that a wide eye-voice span is a factor in good reading while a narrow eye-voice span is a factor in poor reading.

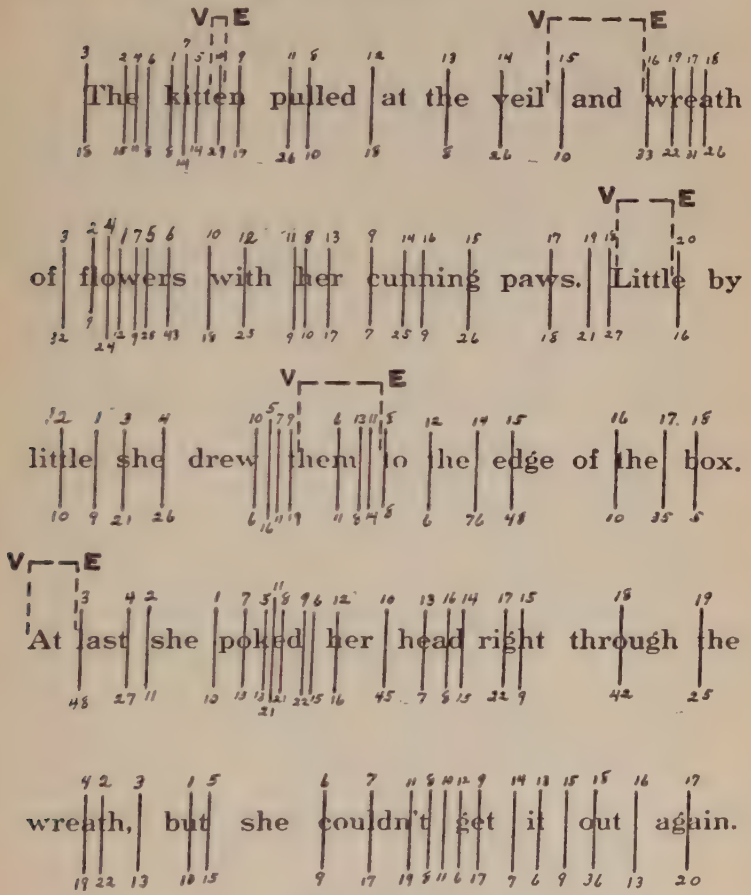
The kitten pulled at the veil and wreath
of flowers with her cunning paws. Little by
little she drew them to the edge of the box.
At last she poked her head right through the
wreath, but she couldn't get it out again.

PLATE VI

EYE-VOICE SPAN OF A POOR READER IN GRADE II

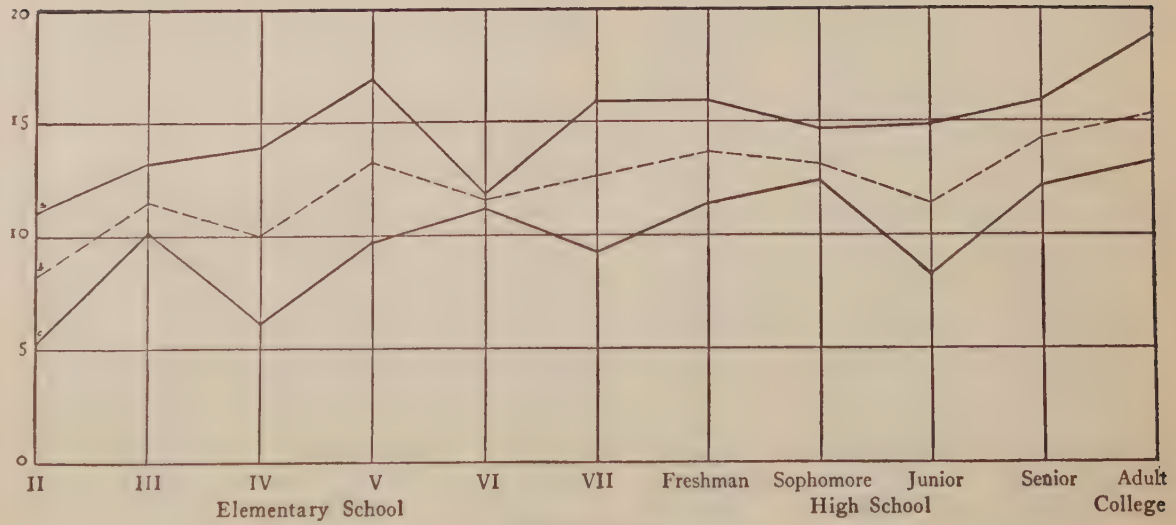

FIGURE III

DEVELOPMENT OF THE EYE-VOICE SPAN OF 54 SUBJECTS

The development of the eye-voice span of the twenty-four pupils in the elementary grades, as presented in Table 4, is shown in graphic form in Figure 3, along with the development of the eye-voice span, of twenty-four students in high school and six in college, representing the adult type of reader. It will be noted that the good readers show a marked improvement from the second to the fifth grade, their average eye-voice span mounting from 11.0 letter-spaces in the second grade to 16.8 in the fifth. This average is not surpassed in any of the subsequent elementary grades or in any of the high schools. The drop in the line for the good readers in the sixth grade is attributed to an extremely low average of one subject, and is not therefore significant of a class tendency. The fact that the bulk of the progress is found in grades second to fifth inclusive would seem to indicate that these are the grades in which training to widen the eye-voice span might be given with the greatest efficacy. The further fact that the peak was reached by the fifth grade could seem to render questionable the value of training given after that grade. The lower grades are the ones in which oral reading receives the greatest attention. Inasmuch as a wide eye-voice span is an important factor in effective oral presentation, the training to widen the span would seem to come most

satisfactorily in the first four grades. It is entirely probable, in the writer's judgment, that if such training were started in the second grade, the peak of improvement would be reached by the fourth grade.

While the relative amount of improvement fluctuates in the different grades, Figure 3 brings out strikingly the fact that in all the grades, the good readers have an unmistakably wider eye-voice span than the poor ones. This is true not only in the elementary school but in the high school and college as well.

Conclusions.—The important conclusions following from Buswell's investigation of the eye-voice span and its relation to other factors in reading, as stated by him, are as follows:

1. There is a positive correlation between a wide eye-voice span and mature reading. The average span for good readers is greater than that of poor readers in every school grade.

2. The development of the eye-voice span through the school period does not show a consistent increase from grade to grade, but is very irregular. The average span for the high school is greater than that of the elementary school. The average span of the adult subjects is greater than that of those from the high school. But some good readers from the elementary school have a span greater than most of the high school subjects.

3. The width of the eye-voice span shows little correlation with position in the line, except that the span at the end of a line is slightly narrower. A high correlation is shown between eye-voice span and position in the sentence. The average width

of the span at the beginning of a sentence is greater than at the end of the sentence by forty-six percent, while the average within the sentence is greater than that at the end by twenty-three percent. These percentages are for all fifty-four subjects including both good and poor readers.

4. A comparison of reading rate with eye-voice span shows that rate of reading and width of eye-voice span increase together. There is a high positive correlation between these two factors of reading.

5. A negative correlation exists between the eye-voice and the number of regressive movements per line. However, if the regressive movements are analyzed into their various types, a positive correlation is shown between eye-voice span and that type of regressive movements caused by too long a forward sweep of the eye. As the eye-voice span increases in width the number of fixations per line decreases.

6. Little correlation is evident between eye-voice span and the number of regressive movements per line. However, if the regressive movements are analyzed into their various types, a positive correlation is shown between eye-voice span and that type of regressive movements caused by too long a forward sweep of the eye. As the width of the eye-voice span increases, the percentage of regressive movements caused by this habit of attempting a long forward movement increases. This type of regressive movements must be considered as a characteristic of mature reading.

Buswell further continues the statement of his observations:

"This study shows that a wide eye-voice span occurs in common with good quality of reading, rapid rate of reading, a small number of fixations per line, and a certain type of regressive movements. All of these qualities may be described as characteristic

of a mature reader. It is also evident from the data shown that a narrow eye-voice span occurs with a poor quality of reading, a slow rate, a large number of fixations per line, and a larger percentage of a type of regressive movements which are not characteristic of good reading. These qualities may be considered as characteristic of persons whose reading habits are immature.

"The results of the preceding analysis make it very clear that the development of a wide eye-voice span is a significant element in oral reading. As will be shown later, in silent reading a similar meaning-recognition span exists which appears to be closely related in its development to the eye-voice span. Since the width of eye-voice span is a factor of mature reading it should receive very definite attention in methods of teaching reading. However, it is difficult to find any allusion to the subject in any of the method texts or manuals. No evidence can be found that elementary teachers in the public schools give any attention to the problem in their teaching, probably because no specific methods are available for dealing with it. Expert teachers of primary reading have worked out a few devices, based upon rapid scanning of phrases and the use of familiar material, which they use in their own classes, but they say that there is nothing available

in the literature of reading methods which deals specifically with training for a wider eye-voice span. It is not the function of this investigation to devise methods of teaching, but it is in place to state that here is a significant factor of reading which is in need of specific training methods. The problem is to devise methods which will develop a habit of pushing the eye further ahead of the voice in order that there may be an interpretation of meaning in larger units."

The Stage in the Reading at Which Meaning Occurs

At what stage in the reading process does the recognition of the meaning of a passage occur? Does the interpretation of the meaning keep pace with the voice or with the eye, or is it to be found at some place between these two? The location of the meaning would seem to vary with the degree of the maturity of reading habits. In the case of primitive or very immature reading, the eye and the voice, and the effort to interpret are all focused upon the same word and may be said to occur practically simultaneously. The eye-voice span is at its minimum. In cases where the visual form of a word is unfamiliar, but its oral sound is a cue to its meaning, the process of interpretation must wait not only upon visualization but also upon vocalization. If

the correct auditory stimulus is not reached, the meaning is not forthcoming. An instance of this degree of immaturity where the eye, the voice, and the meaning are very close together is shown in line 1 of Figure 4. A slightly more advanced

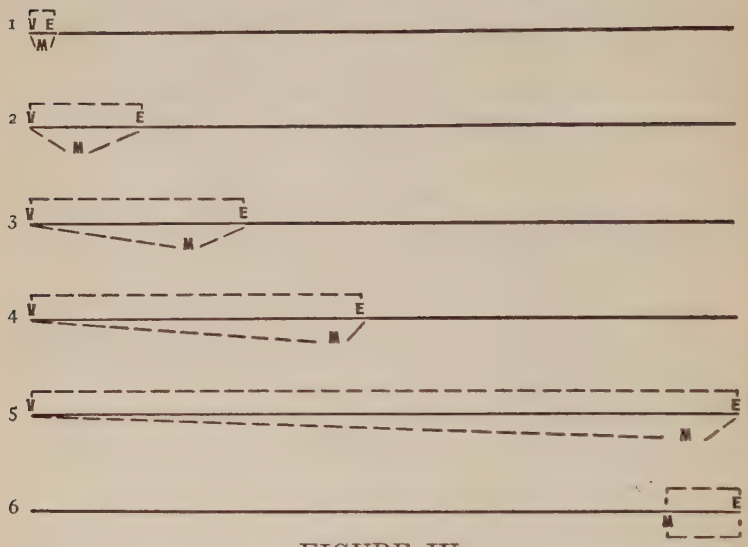

FIGURE IV

THE DEVELOPMENT OF THE ATTENTION SPAN IN READING, SHOWING ALSO THE LOCATION OF MEANING IN VARIOUS STAGES OF READING EFFICIENCY (FROM BUSWELL)

stage is shown in the record of a third grade pupil with an eye-voice span of eight letter-spaces as shown in line 2. Here is illustrated a slight widening of the general attention span which enables the meaning to be grasped even though the eye is several

spaces ahead of the voice. The probability is, however, that the reader is still dependent upon the sound of the words for their meaning so that the M, representing the meaning, is shown somewhat closer to the voice than to the eye. In line 3 is shown the record of a pupil whose average eye-voice span is 19.7; while in line 5, an eye-voice span is shown at a particular point, where the reader's eye was forty-six letter-spaces ahead of her voice. In these latter three lines, the meaning is represented as much closer to the eye, as the dependence of the process of interpretation upon the vocalization of the word has now entirely ceased.

The width of the eye-voice span as shown in these lines is based upon actual records, while the location of the meaning is merely schematic, there being of course no objective evidence for the exact determination of its location. In line 6 the situation in silent reading is shown. Here consciousness, relieved of the necessity of attending to the vocal pronunciation, can be focused entirely upon the eye and the meaning. This, in the writer's judgment, is the important reason why comprehension in silent reading is usually so markedly superior to that in oral reading.

The Complex Character of Meaning.—Concerning the complex character of meaning and the point of its occurrence in the general thought process

lying back of the eye-movements in reading, Buswell gives this penetrating analysis: "Meaning itself is not a unitary and complete sort of thing which occurs instantaneously at certain points through the reading. After a reader has mastered his vocabulary, the recognition of the meaning of words, except in the case of new or difficult ones, doubtless occurs as soon as the eye perceives the words. The recognition of the meaning of words therefore might be said to keep pace with the eye. But the complete meaning of a sentence or a paragraph is not made up by summing together the individual meanings of the words. The meaning of each word in a sentence is modified by what precedes and follows. Phrases, clauses, or whole sentences are the units and the recognition of the complete meaning must be in a liquid state during the reading process, being subject to continual change and being held in the mind to a tentative fashion until the end of the unit of thought is reached. To speak of a location for the recognition of such a developing meaning as this would probably refer to the focal point in the moving conscious state or attention span by which the mind 'carries on' in the reading process. That this focal point or the apex of the moving attention would be nearer the eye than the voice is also indicated by the amount of conscious attention

given to these two factors. The motor reaction of the voice ultimately becomes quite automatic. It follows along behind the eye at a distance such that the immediate memory association with the material perceived is kept intact but it is back in the margin of consciousness as long as no special difficulty is encountered. The principal part of the attention span is concerned with the new materials which the eye is receiving, and with translating this into the meaning whole. Consequently the focus of attention is centered around the eye and the meaning, while the voice is largely left to pronounce the words automatically with a minimum amount of consciousness accompanying it."

Wide General Attention Span is Underlying Cause.—Experimental evidence has abundantly demonstrated the intimate relationship between a wide eye-voice span and a good quality in reading. But in this relationship which is cause, and which is effect? Is a good quality of reading attributable to a wide eye-voice span or is a wide eye-voice span traceable to a good quality of reading? The evidence would seem to indicate that neither is the cause, but that this factor must be traced back to that which lies behind both, namely, a general attention span which is sufficiently wide to hold a considerable number of words or reading elements in

the focus of consciousness at one time. Photographic records of readings of varying degrees of efficiency clearly show that the stumbling, immature reader is able to hold only a few letters or a single word in the focus of consciousness, while the capable mature reader holds several entire words in the focal point. Improvement in reading would seem to be contingent therefore upon the development of an attention span which is wide enough to stretch out over a number of words, thus allowing the eye to explore the way in advance of the voice.

In this advanced exploration of the eye, the meaning is gathered and the voice, on reaching the words later, is in a position to render them with suitable expression. On the other hand, whenever the eye and voice are both centered on the same word, the reading immediately becomes poor and halting. A striking confirmation of this is found in the record of the subject whose eye-voice span at one place reached forty-six letter-spaces as shown in line 5, Figure 4, yet whose span was narrowed to only five letter-spaces when an unfamiliar word was encountered. There was an immediate reversal from the type of rapid easy eye-movement habit with any accompanying wide eye-voice span, to the primitive mode of attack with numerous fixations and the

narrow eye-voice span characteristic of immature reading.

A study of the records of readers varying from primitive immaturity to experienced maturity points to three chief stages in the development of the reading process. In the first stage the eye, voice and meaning are all focused on the same word, and these three elements proceed together step by step, from word to word. This is the stage of immature, halting oral reading. In the second stage the eye reaches out a considerable distance ahead of the voice and the meaning is closer to the eye than to the voice. In the third stage the consciousness is entirely freed from the necessity of attending to the behavior of the voice, and is focused directly upon what is presented to the eye and upon the meaning content. In the hierarchy of reading habits, those of this last stage must always rank high in the estimation of readers who are more concerned in securing the thought of a passage than they are in exhibiting its articulatory sound.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. What evidence indicates that the eyes are practically "blind" during the interfixation movements?

2. Contrast the modern scientific view of the physiological processes in reading with the old traditional concept. Contrast these two views of the mental processes in reading.

3. What are the chief characteristics in the eye-movement habits of slow readers? Of stumbling readers?

4. What is the difference, as a rule, beween the eye-voice span of the good reader and of the slow halting reader?

5. What are the pedagogical corollaries deducible from the findings concerning eye-voice span in reading?

6. At what stage in the reading process does the recognition of the meaning of a passage occur?

7. What is the relative location of the eye, voice, and meaning in immature reading? In mature reading?

8. Describe the complex character of meaning.

9. Is a good quality of reading attributable to a wide eye-voice span, or is a wide eye-voice span traceable to a good quality of reading?

10. What is the importance of a wide general attention span in reading? What is its probable relationship to the two factors mentioned in question nine?

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CHAPTER IV

GROWTH STAGES IN THE FUNDAMENTAL ELEMENTS OF READING

AN INSIGHT INTO THE PSYCHOPHYSICAL PROCESSES OF READING WHICH WILL AID GREATLY IN MAKING THE TEACHER'S WORK MORE INTERESTING

What progress are my pupils actually making? Are they moving forward or backward, or are they at a standstill? If they are progressing, how does their progress compare with that made by similar grades elsewhere? These are questions which come naturally into the mind of probably every teacher at times during the school year. For, work is always more interesting, and usually more successful, when it is accompanied by a knowledge of its results.

One of the methods by which the preceding questions can be answered is through the application of standardized tests. In the case of reading, both the rate and comprehension can be measured by standardized tests. The class averages in these two phases of reading can then be compared with the norms which reflect the averages achieved by hun-

dreds of other classes. By this means the teacher can determine how her class compares with others —whether it is normal, subnormal or supernormal in its attainments. In oral reading, likewise, standardized tests are available to measure the relative efficiency of the class. By applying these standardized tests periodically the teacher can also measure the amount of improvement effected by the class within a specific time. Because of their objective character and the reliable information they furnish, standardized tests are of great value to the teacher of reading. They reveal the results being obtained from the present method of procedure and thus render possible wise alterations of the method to meet the weaknesses or needs disclosed.

Scientific Findings Furnish Basis for Construction of Effective Technique in the Teaching of Reading

Helpful as standardized tests are in revealing the progress in reading ability, there are some phases of that process upon which they can throw no light. They measure reading as a lump product, a total complex. They do not analyze that complex into its constituent processes and reveal the development in the specific factors which go to make up reading ability. They are like the chronometer which meas-

ures the speed with which a swimmer shoots through the water, or the yardstick which tells how high a runner has jumped, but is silent about the kind of strokes, the movements and the form used to attain those results. Yet a knowledge of these specific processes is helpful, inasmuch as it enables one to determine the kind of movements and the form which produce superior results, and those which yield inferior ones. This knowledge constitutes the basis upon which the teacher or coach can then proceed to build effective types of training or instruction.

Insight into the Psychophysical Process of Reading Renders the Teacher's Work More Interesting.— So it is with reading. Reading is a complex consisting of a number of distinct elementary processes. It is helpful for the teacher to know the character of these specific processes in inferior reading and those which function in superior reading. This knowledge would not in itself constitute a method of teaching, but it would reveal the specific factors which condition the efficiency and which must be secured in any effective method. It would thus form the basis for the construction of a scientific technique of procedure, in contrast to the haphazard methods of earlier generations when such analytical light was lacking. A knowledge of the constituent

psychophysical processes of the reading complex not only opens up a vista for the teacher which renders her work more interesting and fascinating, but it offers many cues for her practical guidance in the teaching of reading.

The analysis of the reading complex and the determination of the specific constituent processes which produce superior reading is the work of the psychologist. There are few, if any, phases of the pupil's work upon which so many elaborate and such painstaking psychological investigations have been focused as upon the reading process. These investigations have yielded rich results, so that now the psychologist is able to chart with substantial accuracy the path of the development of the different constituent processes which characterize the transition from immaturity to maturity in the complex act of reading. In other words, he is able to plot the general curves of growth, on the physiological side, of the essential factors in reading ability.

Steps in Transition to Reading Maturity.—Before describing the physiological basis of the growth in reading ability, it will be helpful to discuss briefly the three elements in this development which manifest themselves in an external manner to the teacher. The first element is the ability to pronounce printed words. At the beginning the entire consciousness

of the reader is usually focused upon the effort to translate certain visual elements into their appropriate sounds. The vocalization is generally slow, halting, and not infrequently inaccurate. As the beginner, after considerable training in word analysis and in phonics, gradually acquires the ability to articulate the printed words correctly, the process begins to require less conscious attention, thus permitting more attention to be focused upon the reading side. But in the earlier stages of reading, the ability to pronounce words correctly remains as one of the reliable indices of progress in reading. The normal curve of such progress for a class is more or less familiar to the experienced teacher.

The second element in the growth in reading ability is the comprehension of the meaning of the printed symbols. This necessitates a background of experience, sufficiently rich to afford a basis for the interpretation of the new word. As the new is learned only in terms of the old, there must be some associations through which the meaning content of the new symbol may be assimilated. Words which imply abstract concepts, utterly alien to the ordinary scope of the child's experience, may be mastered in regard to their phonetic elements, but their meaning is apt to be vague and shadowy until there occurs an extension of the child's experience, sufficient to

give vitality and substance to the meaning content. Until that time such words are like sealed boxes, the contents of which are unknown. The acquisition of the thought content of an appreciably large number of words is an indispensable step in the pupil's progress in reading.

The third element is the ability to interpret a phrase, a sentence or a paragraph. This is quite a different mental process from the consecutive recognition of each individual word. That which differentiates intelligent reading from the mere calling of words is the interpretation of the thought, not word by word, but in its logical thought units of whole phrases and sentences. In the former process the consciousness is focused upon the words, in the latter upon the thought content. The ability to focus the attention on the units of thought expressed in a passage distinguishes the mature reader from the immature.

As Buswell has pointed out, "Maturity in interpreting words in their relations involves the ability to fuse a number of words in the particular order in which they occur, into a single thought whole. The demand is chiefly upon the higher mental processes rather than upon the eye, although until the eye has so mastered the perception of words that attention can be withdrawn from the act of fixation,

it will be impossible to give maximum attention to the process of interpretation." The development of the ability to interpret the thought of a passage in its larger units continues throughout the entire school career, and is probably the most vital of the three elements mentioned in the growth of reading ability.

Various Methods of Measuring Growth in Reading Ability

Rate of Reading Measures Growth.—Various means have been employed to determine the chief stages in the transition from immaturity to maturity in reading ability. One of the useful means is to secure a measure of the rate of reading. The standards for rate for the different grades are widely known. Furthermore, there is a large mass of evidence which establishes a high correlation between rate and general reading ability. While there are individual exceptions, yet as a rule it has been found that the rapid reader has superior comprehension of the thought content to the slow, dawdling reader. Hence the simple measurement of the rate is a helpful means in ascertaining the particular stage of a class in its journey to reading maturity.

Standardized Educational Tests Measure Growth.

—Standardized educational tests measuring comprehension, rate, ability to execute printed directions, to classify, etc., reveal the attainment in many of the characteristics of reading. But they do not and cannot go back of the results to the detailed specific processes producing the results. They do not disclose the specific weakness in the actual reading process. Yet it is important to penetrate beyond the lump results to know which of the specific processes of the reading processes are defective, and hence stand in need of training, and which are the processes which show satisfactory or normal development.

Photographic Records of Eye-Movements Reveal Growth in the Different Fundamental Elements of Reading.—The only satisfactory method of studying the detailed specific processes is by securing photographic records of the eye-movements. While the movements of the eyes are merely mechanical processes resulting from contractions of the external ocular muscles, yet they reflect the character of the central thought processes occurring in the mind. Abundant experimental evidence has established the high correlation between the character of the ocular motor control and the effectiveness with which a passage has been comprehended by the mind. The immaturity of the reader manifests itself in the

large number of fixations per line, the narrowness of the visual span, and the frequency of the regressive movements of the eyes. The mature reader employs a delicately coördinated type of movement which is almost the opposite of the one just described.

Significance of Eye-Movement Habits

Just as the rate of the pulse serves as a reliable measure of the heart-beat, so do the eye-movement processes serve as the external counterparts or indices of the internal conscious processes. It is because of their symptomatic value that eye-movements have been studied so intensively and with such fruitful results. They have the additional advantages of being objective and hence capable of being photographed, and are reliable because they are not subject to the direct conscious control of the reader. The widening of the visual span and the lessening of the duration of the fixation pause are the factors which serve as reliable indices of the growth in rate of reading while the elimination or reduction of regressive movements indicates the improvement in the comprehension of the matter read.

Through a generous appropriation of the General Education Board, rendering possible the construc-

tion of the necessary mechanical equipment, the most extensive photographic investigations of eye-movements made in recent years have been conducted at the University of Chicago under the direction of Professor C. H. Judd. The problem of determining the stages in the development of eye-movement habits as the reader passes from immaturity to maturity was attacked by G. T. Buswell [1] of that institution. On the basis of the data obtained from his elaborate and painstaking investigation, he has plotted the curves of growth for the chief processes in the reading complex. The method of procedure and the results obtained by Buswell, especially the growth curves, serve to give the teacher a deeper insight into the nature and the development of reading ability and are pregnant with suggestions for increasing the effectiveness of the technique she employs.

An Investigation of Growth Curves in the Three Fundamental Elements

Growth in the Visual Span.—The investigation sought to determine the stages of growth for the three fundamental elements of reading. The first

[1] G. T. Buswell, *Fundamental Reading Habits: A Study of their Development*, Supplementary Educational Monographs, No. 21, June, 1923, University of Chicago Press.

element, the visual span used in the reading of printed matter, was measured by the average number of fixations per line. The second element, the rate of recognition regardless of the amount of matter recognized, was determined by the average duration of the fixations. The third element, the regularity or progressive sequence of the perceptions along the printed line, was evidenced by the average number of regressive movements per line. With certain improvements added to it, the photographic apparatus which has been previously described, was used in this investigation.

The eye-movements of 186 pupils, chosen from all the grades in the elementary school and high school, and from an adult college group, were photographed. The effort was made to select pupils of average reading ability, since the purpose was to ascertain the normal growth curves. In the high school junior class, it appears, a few rather superior students were included in the group of subjects.

The same selection was used for all the pupils, except those in the first grade who found the passage somewhat too difficult. An easier selection was used by them. For all the other subjects the same passage was employed in order to eliminate the disturbing factor of varying degrees of difficulty in the material so that the results would reflect the normal

growth curves. By keeping the material constant, differences in eye-movements were indicative solely of the varying stages of maturity in reading ability.

The instructions given to the pupils were to "read this story as you ordinarily do, to find out what it is about." The mechanical apparatus did not appear to disturb the natural reading attitude of the subjects. An average of less than five minutes was required to secure a photographic record of the reading of each pupil. As the records were taken in the last month of the school term the averages reflect the accomplishment of that period in the scholastic year. The length of the line was kept constant, being 3.5 inches for all the selections read.

Growth in Rate of Recognition.—Experimentation has demonstrated that it is as easy to perceive a number of complete words as it is to perceive the same number of single unrelated letters. Indeed, it is easier and requires less time to read ten words arranged in a meaningful order, than it does to read ten unrelated single letters. If the reader will perform the simple experiment of noting the number of seconds required to read silently the letters, y-m-x-o-b-p-z-h-r-c, and the time required to read the complete sentence, "The man ran very quickly out of the burning building," he will discover for himself the truth of this statement. The reason for this is that

the experienced reader not only does not look at the individual letters in a word, but takes in several whole words constituting a unit of meaning, in a single recognition span. The attention is focused not upon the form of the words but upon the links in the chain of thought. Each link of thought unit is grasped as a whole, even though it embraces three or four words.

By recognition unit is meant the amount of printed material that can be grasped in a single span of attention. The size of the recognition unit can easily be determined by counting the number of attention spans used per line. Thus in a line consisting of nine words, grasped in three attention spans, the average unit of recognition would be three words. The recognition span widens as the number of fixations per line decreases.

In Figure 5, the growth curve in span of recognition in silent reading is shown for the grades by the broken line. A careful inspection of this curve reveals three distinct tendencies:

1. The growth up to the end of the fourth grade is very rapid.
2. A plateau is reached in the fifth grade and continues to the end of the freshman year in high school.
3. A second gain is made during the middle high school years.

The most impressive single fact disclosed by the curve is the conspicuously rapid development of

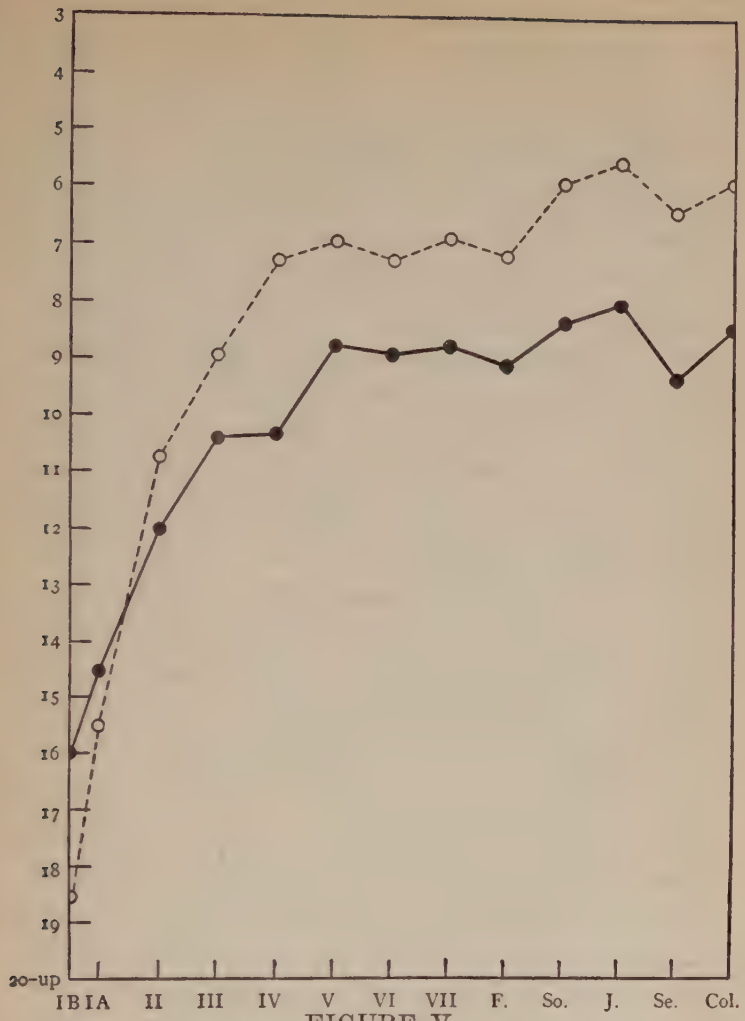

FIGURE V

GROWTH STAGES IN SPAN OF RECOGNITION IN SILENT AND ORAL READING AS SHOWN BY NUMBER OF FIXATIONS PER LINE (FROM BUSWELL)

The school grade is shown on the horizontal axis; the average number of fixations per line is shown on vertical axis. The broken line shows curve for silent reading; the full line shows curve for oral reading. This figure is to be read as follows: In silent reading in Grade 1B, the average number of fixations per line is 18.6; in Grade 1A, the average number is 15.5; in Grade 2 it is 10.7; and so on through the grades until for the adult college group the average number of fixations per line is only 5.9. In oral reading in Grade 1B, the average number of fixations per line is 16.0; in Grade 1A, it is 14.5; in Grade 2 it is 12.0 and so on through the grades until for the adult group it is only 8.4.

the recognition span in the first four grades. Why does this growth not continue through the remaining school years up to the maximum medium? Buswell suggests that the plateau may perhaps reflect a change in the character of the school work in those years. In the first four grades, a large amount of time is devoted to reading. The material is as a rule easy of comprehension. In the fifth grade and continuing through the remaining grades and into the freshman year, less time is devoted to reading as such. Moreover, the subject matter, increasing in difficulty, demands new types of reading habits. Materials in a textbook in arithmetic or in a foreign language calling for different purposes in reading demand different methods of attack. New habits of reading are built up to meet the changed types of subject matter and the different uses to which the subject matter is now put.

The upward slope of the curve in the middle high school years may mean that the pupil has now adjusted himself to the different types of study and different levels of difficulty in the subject. Under the stimulation of extensive reading requirements in literature and history, a further widening of the recognition span results.

A scrutiny of the growth curve for span of recognition for oral reading in Figure 5 shows that nearly

all the development was reached by the end of the fifth grade; beyond that the growth was very slight. A comparison of the oral and silent curves brings out strikingly the superiority of oral over silent reading in all the grades above the first in width of recognition span. It reveals one of the fundamental differences in the physiological basis of these two processes. Silent reading stimulates wider attention spans, while the retarding influence of the musculature of articulation results in an appreciable narrowing of the recognition span in oral reading.

Of the three fundamental elements in the reading process, size of recognition span, duration of fixation, and regularity of fixation, the writer regards the first element as the most significant. The width of recognition span gives a direct and immediate clue to the rate and fluency of reading. The light it casts upon the comprehension is scarcely less important. It discloses whether the subject is grasping the meaning of the passage in thought units, or is concerned with the meaning of each word and the subsequent effort to fuse the separate meaning to secure the complete total thought.

The ability to focus the direct consciousness upon the thought content, relegating the recognition of the words through the mechanical or typographical form to the secondary attention, is the unmistakable

characteristic of maturity in reading. The width of the recognition span gives probably the most reliable index to that characteristic of maturity. The fact that the recognition span in all the grades above the first is markedly superior in silent to oral reading, is significant. It reveals one of the most important reasons for the superior efficiency of silent reading, not only in rate but in degree of interpretation and thought mastery as well.

An inspection of the broken line in Figure 6, showing the curve for silent reading, reveals that the increase in rate of fixation is very rapid up to the end of the fourth grade. A much smaller increase continues on through the sixth grade, the median of which surpasses that for the adult college group. Fifty-two subjects average five twenty-fifths of a second, while four pupils succeeded in making a shorter average. This indicates that the limit of fixation time is approximately five twenty-fifths of a second. "From these data," says Buswell, "it is evident that a speed of fixation from five to six twenty-fifths of a second satisfies the demands of maturity in reading. It is also evident that it is entirely possible to reach this level by the end of the fourth grade. Rate of recognition, therefore, is one element of reading which can be carried to the level of maturity during the school period." It is to be

noted that the medians for silent reading are superior to those for oral in all the grades.

Growth in Regularity of Eye-Movement.—One of the characteristics found in the eye-movement records of mature readers is a regular rhythmical progression along the printed line. In sharp contrast with this, the immature reader makes many backward movements to refixate words previously seen but not comprehended. This oscillation of the eye-movements back and forth indicates periods of mental confusion, and shows the failure to recognize the words and to interpret their thought content. The regularity of the movement of the eyes along the printed line is determined by the average number of regressive movements.

A glance at the broken line in Figure 7 shows that the growth in regularity of movement in silent reading is very rapid during the first four grades. An improvement is also recorded in the high school and college, indicating that the possibility of increased efficiency in the upper grades is appreciably greater for this habit than for that of duration of fixation pauses as shown in Figure 6. The curve for oral reading in Figure 7 shows a growth during the first six years but no appreciable improvement beyond this. The medians from the sixth grade on for oral reading are considerably inferior to those

for silent reading. It is quite possible that the development during the first six years for the oral curve reflects the training in oral reading, while the necessity of pronouncing the words in the proper order stimulates the regular progressive movement of the eyes along the printed line.

Correlation of Growth Curves With Reading Efficiency.—The relationship between the growth in each of the three elements in silent and in oral reading, and the progress in reading ability as determined by objective, standardized tests, was also investigated by Buswell. The results of such a comparison show the significance of the development of each of the foregoing discussed factors in affecting the final reading product.

Eighty pupils in grades from the second to the sixth inclusive were tested on the Gray Oral Reading Paragraphs. The results of the test show that, as a general rule, growth in the span of recognition is paralleled by an improvement in oral reading ability as determined by freedom from such errors as mispronunciation, substitution, repetition, omission and insertion of words. Growth in the other two elements, lessening the duration of the fixation pause and in increasing the regularity of the eye-movements along the printed line, was likewise accompanied, as a general rule, by improvement in

oral reading as measured by Gray's Standardized Test.

Comparison of Growth Curves for the Three Elements of Silent Reading.—The character of the development of each of the three fundamental elements may be compared with one another, and their significance upon the progress of reading in the grades can be more easily and clearly grasped if all the curves are plotted on the same graph. For this purpose the curves for each three elements were reduced to a similar scale. The percentage of increase for each of the grades was determined by taking the median for Grade 1 B as the base. The percentages are presented in Table 5, and are shown in graphic form in Figure 7.

An inspection of Figure 7 shows clearly that the great bulk of the growth in the three elements occurs during the first four grades. The increase after that point is comparatively small. The end of grade 4 seems to be the crucial turning point, where the upward curve bends perceptibly into the plateau of the upper grades. The growth in the three fundamental elements becomes less rapid at this point and remains almost at a standstill in the four upper grades. What is the explanation of the divergence of the three growth curves at this point? Why is the type of development of these three fundamentals

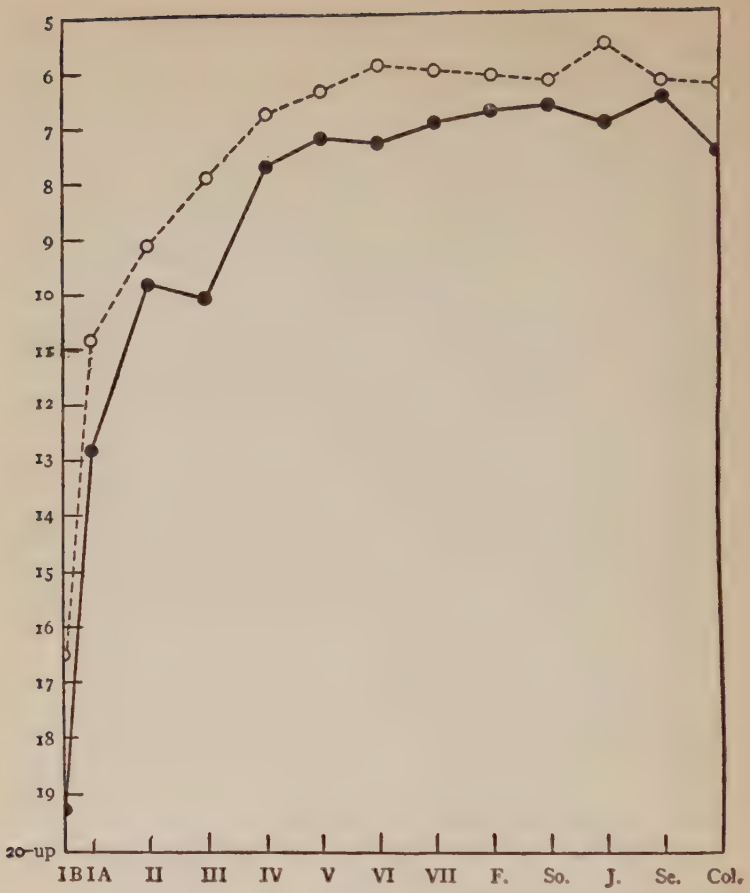

FIGURE VI

GROWTH STAGES FOR AVERAGE DURATION OF FIXATION PAUSES IN SILENT AND ORAL READING (FROM BUSWELL)

The school grade is shown on the horizontal axis; the average duration of fixation pause is shown on the vertical axis. The broken line shows curve for silent reading; the full line shows curve for oral reading. This figure is to be read as follows: In silent reading the average duration of the fixation pauses in Grade 1B was 16.5 twenty-fifths of a second; in Grade 1A 10.8 twenty-fifths of a second; in Grade 2, 9.1 twenty-fifths of a second; and so on for all the grades until for the college group the average duration was only 6.3 twenty-fifths of a second. In oral reading, the average duration of the fixation pauses in Grade 1B was 19.2 twenty-fifths of a second; in Grade 1A, 12.8 twenty-fifths of a second; in Grade 2, 9.8 twenty-fifths of a second, etc.

so radically different in the four remaining grades?

The answer would seem to be that a large portion of the subject matter to be read in these grades is different, and in most cases, probably more difficult. There are more mathematics, more grammatical syntax, and other subject matter of this character which must be dealt with in the higher grades. In the lower grades, reading receives by far the lion's share of the school day. It is estimated that approximately 70 percent of the time in the primary grades is devoted to reading. An elaborate technique is brought to bear on the teaching of reading. Dramatization, games, black-board exercises, picture cards, charts, etc., are employed because they serve as so many auxiliary devices for the interpretation of the printed word. The stories in the readers and most of the other material to be read are easy of comprehension.

At the end of the fourth grade the emphasis is shifted from reading to arithmetic and grammatical syntax. The school work requires the pupils to put the subject matter read to different uses. New purposes in reading and new reading attitudes are developed. The type of eye-movement in fixating a column of figures that are being added—as will be shown in detail later on—is radically different from the eye-movement habits developed in reading

an interesting story. The consequence of the differences in type of subject matter, in variety of purposes for which it is read, and in the general shift of emphasis from reading exercises to the rather heavy content materials of such subjects as arithmetic and grammar, is doubtless reflected in the change in the curves and in the changed type of development of eye-movement habits.

It is to be noted, however, that the curves of growth as reported by Buswell undoubtedly reflect the present practice of the school grades in the treatment of reading. What would be the result of a serious modification of the reading courses in the four upper grades? Could not types of reading courses be devised which would recognize the new requirements which the changed subject matter in the upper grades makes upon the reading habits, and thus eliminate the plateau in these grades?

These are interesting questions which await the hand of the investigator. Inferential evidence, however, is not altogether wanting. The percentage of increase in reading rate as recorded by Waldo showed a marked falling off in the upper grades, beginning in fact at the end of the fourth grade. The smallness of the increase reflected the conventional treatment of reading in the upper grades. Yet the results of an investigation conducted by the writer

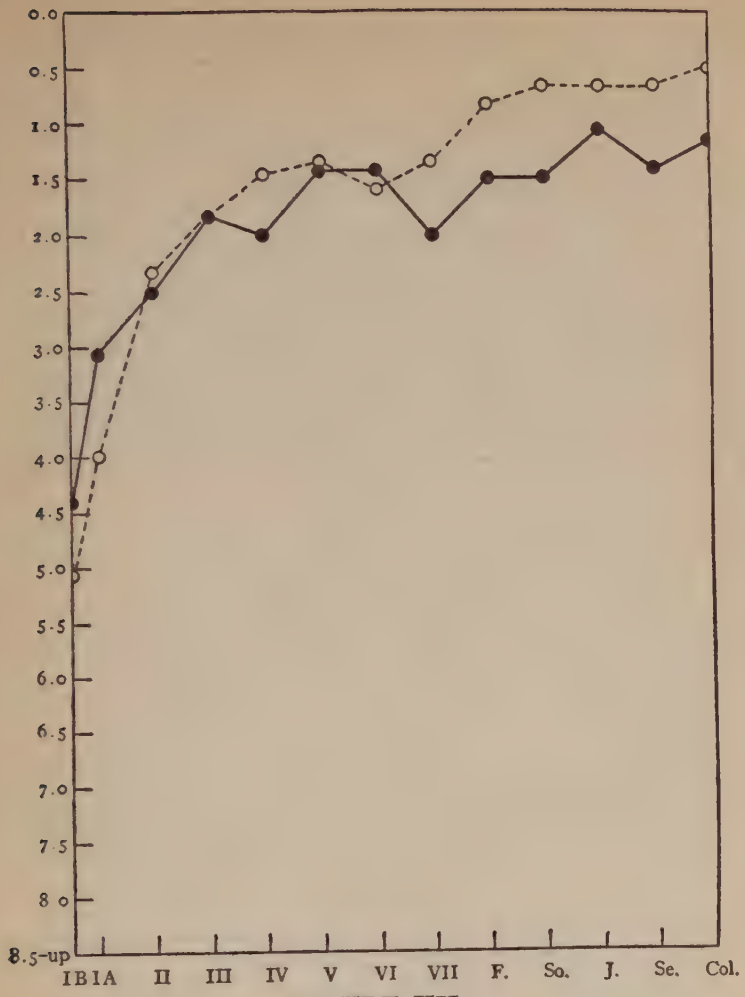

FIGURE VII

GROWTH CURVES IN REGULARITY OF PROCEDURE ALONG THE LINE, IN SILENT AND IN ORAL READING, AS SHOWN BY THE AVERAGE NUMBER OF REGRESSIVE MOVEMENTS PER LINE (FROM BUSWELL)

The school grades are shown on the horizontal axis; the average number of regressive movements per line are shown on the vertical axis. The broken line shows curve for silent reading; full line shows curve for oral reading. This figure is to be read as follows: In silent reading the average number of regressive movements per line in Grade 1B is 5.1; in Grade 1A, it is 4.0; in Grade 2, it is 2.3, etc. In oral reading the average number of regressive movements per line in Grade 1B, is 4.4; in Grade 1A, it is 3.1; in Grade 2, it is 2.5, etc.

have demonstrated that when pupils in the four upper grades received definite training to accelerate their rate, the substantial increases effected com-

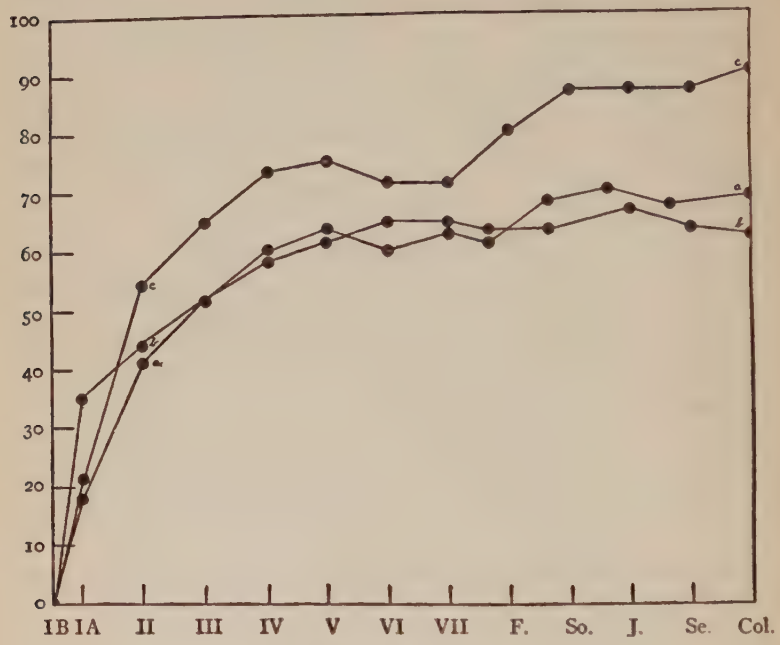

FIGURE VIII

PERCENT OF INCREASE IN GROWTH FOR THREE EYE-MOVEMENT HABITS —SILENT READING (FROM BUSWELL)

The school grade is shown on the vertical axis. Curve *a* represents growth in recognition span as shown by the average number of fixations per line; curve *b*, growth in speed of recognition as shown by the average duration of fixation pauses; curve *c*, growth in regularity of movement along the line as shown by the average number of regressive movements per line.

pared favorably with those achieved by pupils in the lower grades. These substantial increases in

rate must have been accompanied by corresponding increases in some, and probably in all, of the three elements in eye-movement habits. Photographic records of the eye-movements of but a small number of pupils in the four upper grades, who received the special training, showed that the increase in speed and comprehension was accompanied by a development in the three elemental factors in the eye-movement habits of the readers.[2] Whether this

Table 5

Percentage of Increase in Growth Curves of Three Eye-Movement Habits—Silent Reading. (From Buswell)

Eye-Movement Habit	School Grade												
	1B	1A	II	III	IV	V	VI	VII	F	So	J	Se	Col
Average number fixations per line	0	17	42	52	60	63	60	63	61	69	70	66	68
Average duration of fixation	0	35	45	52	59	62	65	64	63	63	66	63	62
Average number regressive movements	0	22	55	65	73	75	71	71	80	86	86	86	90

Table 5 is to be read as follows: Growth in recognition span in Grade 1 A showed an increase of 42% over Grade 1 B; Grade 3 showed an increase of 52% over Grade 1 B, etc.

[2] J. A. O'Brien, *Silent Reading*, The Macmillan Company, New York, 1921.

increase in speed in the upper grades as measured by the Courtis Standardized Reading Test, and the development of the elements of the eye-movement habits that was recorded, would have been produced if these same pupils had received definite training to accelerate their rate beginning in the primary grades and continuing on through the upper grades is a question that needs further investigation to answer satisfactorily.

The curves of growth that have been shown and discussed afford an interesting and penetrating insight into the nature and the development of the three specific fundamental elements in the reading complex. They show the detailed stages in the transition from immaturity to maturity as effected by the present treatment of reading in the schools. The rapidity of the growth in the first four grades shows the remarkable effectiveness of the school's concentrated efforts to equip the child with this basic tool during these years. The plateau into which the growth curves fall at the end of the fourth grade and in which they remain throughout the four upper grades, raises the question—and in the writer's judgment, suggests the advisability—of giving special attention in those grades to the treatment of reading to enable the pupils to cope with

new types of subject matter and different purposes and changed attitudes in reading in the upper grades.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. How do scientific findings furnish a basis for the construction of effective technique in the teaching of reading?

2. Describe the three steps in the transition to reading maturity.

3. What are the various methods of measuring growth in reading ability? What are the advantages and disadvantages of each method?

4. How do eye-movement habits serve as indices of internal conscious processes?

5. What are the three fundamental elements in reading which are recorded in eye-movement photographs?

6. What are the characteristics of the growth curve in the visual span of reading? What explanation can you offer for the smaller amount of growth in this element in the upper grades? What explanation for the upward slope of the curve in the middle high school years?

7. What are the characteristics of the growth curve in the rate of recognition in reading?

8. May this element be carried to maturity before completion of the elementary school course? What are the pedagogical corollaries of this?

9. What are the characteristics of the growth curve in regularity of eye-movements?

10. How does the possibility of improvement in this element in the upper grades compare with possibility of improvement in the two other elements of reading?

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CHAPTER V

ADJUSTMENTS IN READING TO DIFFERENT TYPES OF MATERIAL

The numerous investigations of the last few decades have established a superiority of silent over oral reading in both rate and comprehension. The rapidity with which practical school people have taken cognizance of these findings and have endeavored to adjust their teaching methods accordingly has been a source of great encouragement and stimulation to educational psychologists everywhere. To make the proper adjustments in the technique of teaching, the teacher must be supplied with a knowledge of the fundamental differences in reading attitudes induced by various kinds of subject matter and also by the purposes for which the material is read. Knowledge of this character is especially necessary in the effective teaching of silent reading, which is admittedly more difficult than the teaching of oral reading. For, in the former the symptoms of success or failure are not directly observable, while the variety of types of

possible reading attitudes is much greater and immeasurably more complex. Such information the psychologist endeavors to supply, allowing the teacher to fit the practical school methods to suit the differences in the mental processes in the variety of reading attitudes which the pupil assumes. This is the practical program of coöperation which has grown up between the scientist in the laboratory and the teacher in the classroom.

Different Types of Material Induce Different Reading Attitudes

With a view of securing such data for the teacher, Dr. C. H. Judd and Dr. G. T. Buswell of the University of Chicago recently completed an interesting investigation [1] of the various types of reading. The effort was made first to determine the adjustments in reading, necessitated by changes in the character of the material read. The method employed was the customary one of photographing the eye-movements and then analyzing the ocular behavior recorded.

[1] C. H. Judd, and G. T. Buswell, *Silent Reading: A Study of the Various Types.* Supplementary Educational Monographs, No. 23, November, 1922, University of Chicago Press.

Photographs were secured of the eye-movements of ten fifth grade pupils as they read paragraphs 4, 6, 8, 10, and 12 from Gray's Standardized Reading Paragraphs. The paragraphs represent equal steps of increasing difficulty.

Width of Visual Span is Affected.—How does a pupil adjust his reading when confronted with passages of increasing difficulty? What is the result in changes in the types of eye-movement habits? An analysis of the photographic records reveals the existence of wide individual differences in the methods of grappling with this problem of increasing difficulty. In some instances the reader finds it desirable to increase the number of fixation pauses per line, thus lessening the span of recognition which is the amount of material perceived in a single fixation. For the time being, he is thrown back into the class of immature readers, with their narrow span of recognition, because each part of the printed line now requires a more elaborate mental process of interpretation.

Other Adjustments.—In other instances the reader prefers to adopt the expedient of lengthening the duration of each fixation without narrowing the span of recognition. This affords the reader more time to gather the experiences necessary to in-

terpret a word or phrase. Another type of adjustment in reading which the photographs disclosed was the all too simple expedient of jumping over the difficult words or phrases without deciphering their meaning. Some idea as to the frequency with which pupils employ this expedient when confronted with difficult words or phrases may be gained by the teacher if she will but question them closely on a paragraph that has just been read. A fourth type of adjustment is found in the records which shows the simultaneous employment of a narrower span of recognition and a longer duration of fixation.

A confirmation of these findings resulted from the photographing of the eye-movements of five university students who read long passages of different kinds of subject matter. The passages employed consisted of (1) two poems, *Annabel Lee* as a type of easy verse; and a section of *Paradise Lost* as an example of blank verse; (2) prose extracts from a fiction book; (3) from a textbook in geography; (4) from a manual of rhetoric; (5) from a French grammar; and (6) from a textbook in algebra. The record of one of these subjects, typical in a general way of the others, is presented in Table 6.

Table 6

Record of University Student in Silent Reading of Different Kinds of Passages. (From Judd and Buswell)

Type of Material	Average Number of Fixations per Line	Average Duration of Fixation Pauses	Average Number of Regressive Movements
Fiction	8.5	4.9	2.1
Geography	11.2	5.2	3.2
Rhetoric	11.7	5.0	3.7
Easy verse	13.1	5.0	3.7
French grammar	14.1	5.1	4.0
Blank verse	16.8	5.2	6.1
Algebra	14.4	5.3	4.5

Table 6 is to be read as follows: In reading fiction the subject averages 8.5 fixation pauses per line, with an average duration of 4.9/25 of a second per pause; the regressive movements average 2.1 per line. The record for the reading of geography, rhetoric, etc., is to be read in the same manner.

A scrutiny of the photographic records affords a vivid realization of the widely divergent types of mental attitudes aroused in the reader by the different kinds of subject matter. In general, the reading of the fiction is characterized by uniform brief fixations, relatively few per line, showing the easy fluency of the reading and the freedom from serious mental effort at interpretation. In the simple reading in rhetoric and in geography the eye-

movements are still uniform, but slightly greater mental effort is called forth as manifested by the increased duration of the fixations. Jerky, irregular movements, numerous fixations of relatively long duration, stand out in the reading of blank verse, French grammar and algebra.

Significance of Changes in Eye-Movements.—It is not the changes in the external character of the eye-movements themselves, however, that is of prime importance. These are of significance only because they reflect corresponding internal adjustments in the mental attitude. The mental experience of the reader whose eye-movements are jerky, irregular and halting, is widely different from those of the reader who uses smooth, regular eye-movements. The former experiences a certain roughness and unevenness of impressions and interpretations which are lacking in the latter. "Eye-movements," Judd and Buswell point out, "are but external manifestations of an inner condition which is set up in the central nervous system. Whenever there is a jerky, irregular eye-movement and a short span of recognition, there is a central nervous process which is also irregular and of short duration. Modern psychology has made its most fruitful advances by recognizing the intimate relation of external behavior, and its accompanying

conditions in the nervous system, to conscious experience. The impressive fact about changes in eye-movement is, accordingly, not some consequence of this or that mode of fixation, but the radical change in the total attitude of the reader in the different cases. The muscular tension which is exhibited in reading French grammar is wholly different from that exhibited in reading fiction. This means that the central nervous tension in one case is very different from that in the other case.

"The conscious individual who is manifesting these differences is located at the center of the whole situation, that is, his consciousness reflects what is going on in the central nervous system. He is not aware of the eye-movements, but his awareness of the passage is of the type which is conditioned by the inner-tension of his nervous system. Eye-movements are as direct measures of the mental state as the rate of the pulse is a measure of the heart-beat. The heart-beat, in turn, is not significant for its own sake, but because it is part of the patient's general organic condition. The rate of the pulse is invaluable as a means of diagnosis because it is a part of the total situation."

Reading Patterns are Complex.—The significant fact then that issues from this investigation is this: *Different modes of reading, different types of read-*

ing attitudes are induced by different kinds of subject matter. There are complex patterns of reading, highly individuated, not one uniform mechanical procedure. The study reveals the inadequacy of the explanation of that type of popular psychology which views all reading simply as the recognition of words and all such recognition, no matter under what circumstances it occurs, as a uniform mental process. This psychology maintains that stored somewhere in the mind are multitudes of mental images. When the pupil perceives a word, the proper mental image in some vague, mysterious manner is summoned out of its pigeonhole and tied, by what the older school of psychologists called an association and by what some recent writers have styled a "bond," to the received ocular impression. This visual impression and the mental image, thus tied together by some sort of link, are supposed to constitute a unit or element of mental life. The teaching of reading is reducible, according to this simple type of popular psychology, to the work of binding together visual impressions and mental images. The mind is viewed as a store-house in which great numbers of such linked couples are contained, waiting to be mobilized forth as the occasion requires.

Recent analytical studies of a scientific character reveal the superficiality .of the naïve concept of many pedagogues that the reading of all types of subject matter is a uniform mental process to be accomplished simply by building up associations between words and mental images and then by strengthening those associations. They show that printed pages, containing different kinds of subject matter, induce different mental "sets," different degrees of nervous tension, different types of patterns, according to which the mass of visual impressions is organized and assimilated. The mental process which occurs in the easy, fluent reading of words found in a setting of fiction is radically different from that which occurs in the reading of these same words in an algebra textbook.

The difference in the reading attitude and in the whole central nervous tension is reflected in the transition from the feelings of pleasure and interest to those of the opposite type—drudgery and resentment—which frequently characterize, for example, the algebra textbook attitude.

To regard a retardation of the reading rate and a change in the character of eye-movements as due simply to the encountering of new and more difficult words, is to overlook entirely the influence of

the reading attitude and of the central nervous tension upon the method of attacking the subject matter. "The truth is," as Judd and Buswell observe, "that there is a new general tension in every case in which a collection of words begins to require more effort. The whole organism is drawn into the performance. Every movement of the eye is different, showing that the motor impulses are flowing in the one case out of one kind of central nervous situation and in the other case out of a different kind of central nervous situation. . . . Consciousness is in the one case a pattern or an organized whole of one type; in the other case the words enter into a wholly different pattern."

Conclusions.—The results of the investigation show therefore that differences in the difficulty of the subject matter, and differences in the types of subject matter cause perceptible adjustments in the character of the eye-movement habits modifying the rate, the size of the recognition span, and the duration of the fixations. They likewise induce interesting adjustments in the reading attitude, the degree of tension in the central nervous and in the conscious patterns according to which the visual impressions are organized and interpreted. These differences in mental adjustments must first be recognized and then grappled with by the teacher

who would train pupils in effective reading of different types of subject matter.

As corollaries of practical pedagogical consequence flowing from the investigation, Judd and Buswell draw the following:

"What is needed in addition to a knowledge of the gross fact of change in rate is insight into the complex of facts which causes the change in rate. Teachers need to know that some pupils require for improvement training in rapid observation, while others require training in the experiences which will supply the ideas necessary to facilitate interpretation. Above all, teachers need to realize that a slow rate of reading shows that the pupil's equipment is in some respect incomplete.

"School methods must be devised which will help pupils to improve their reading far beyond the point which is now ordinarily thought of as constituting the terminus of instruction in reading. There ought, for example, to be a technique of teaching high-school students to read algebra fluently and intelligently. There ought to be teaching of methods of reading science. These higher applications of reading ability are not to be ignored or thought of as automatically provided for by training given through the reading of fiction or poetry."

Adjustments in Reading Through Changes in the Attention

Adjustments in reading are induced not only by variations in the type of subject matter but also by different kinds and degrees of attention. The purpose for which the material is read has been shown to be fundamental in adjusting the entire reading attitude.

In an experiment conducted by Judd and Buswell, 20 students were asked to read a passage from Thorndike's Alpha Reading Test in the following manner: "Read this paragraph through once silently. Read it very rapidly as you would a newspaper article, just to find out what it is about." After the first reading, the directions were changed to these: "Now read it again more carefully. When you finish, you will be asked questions about it."

Adapting Reading to the End in View.—The results show that the different kinds of attention resulting from the difference in the directions caused considerable changes in the eye-movement habits and in the general reading attitude. There are many individual types of adjustments which are evidenced, but there is a general tendency to narrow the span of recognition. The study also discloses

that there are some readers who make practically no response to the study attitude or the casual reading attitude. They lack flexibility in adapting their method of reading to the end in view. This constitutes a serious handicap as situations in life call for reading for a great variety of purposes. Thus the person who habitually reads in a study attitude finds himself consuming an altogether disproportionately large amount of time in reading simple material such as news items, narratives, fiction, and similar light material which should be susceptible to very rapid interpretation. There is a great loss of time here. Systematic training in the reading of these different types of material and in reading for a great variety of purposes would obviate this loss.

In the experiment described above, the readers were explicitly requested to assume a certain attitude. Another experiment was conducted in which the reading attitude was induced by less direct means. After six high school pupils had read a passage without having been given any directions concerning the manner of reading it, they were unexpectedly questioned on the material read. When they were requested to read another passage, they read it with the expectancy of being quizzed again. The expectancy was aroused as definitely by this indirect means as if they were formally told that

they would be questioned. The results of the change in the kind of attention upon the character of the reading are presented in Table 7.

Table 7

Records of High School Students Under Varying Conditions of Expectance of Questions (From Judd and Buswell)

	No expectation of questions		Expectation of questions	
	Average number of fixations per line	Average duration of fixation pauses	Average number of fixations per line	Average duration of fixation pauses
A–31	6.6	5.4	7.5	6.6
A–19	8.0	4.1	7.6	5.9
A–22	5.7	6.5	5.6	6.7
A–35	7.8	5.4	7.6	5.1
A–27	6.4	5.7	9.3	6.1
A–28	7.1	5.9	8.7	6.0

Table 7 is to be read thus: The subject (A–31) when reading with no expectation of being questioned averages only 6.6 fixation pauses per line, with an average duration per pause of 5.4/25 of a second; but when he reads with the expectation of being quizzed about the material read, averages 7.5 fixation pauses per line, with an average duration per pause of 6.6/25 of a second.

Lack of Definite Well-Ordered Plan of Attack in Reading.—What is the effect of this state of expectancy, this forward look toward questions, upon the character of the reading? It does not seem to lead,

in the case of most students, to a definite well-ordered plan of attack. It probably induces little more than a vague feeling of worry, a sort of restless distraction, resulting from the danger of being called upon. The school has given the pupil no training in the technique of determining the logical questions implicit in each paragraph. The result is that the pupil goes at the task blindly. At times he narrows the span of recognition, looking at each word carefully, hoping that if called upon he will remember the words rather than the thought of the text. At other times, he lingers longer on each word, seeking to stamp it into his memory through an inner articulation of the word.

Need of Specific Training in Reading for Different Purposes.—The evidence of such wasteful, ineffective methods of handling such material on the part of great numbers of pupils even in the high school lead Judd and Buswell to ask of the school the very pertinent question: "If the school is going to hold over the student the expectation of questions, ought it not to train him in methods of meeting its demands? Ought not the teacher to tell the class how questions are made up and then discuss the matter somewhat as follows? 'In preparing for the next recitation you can anticipate practically everything I am going to ask if you will think about the

purpose of the passages in the text. You need not try to learn the text word for word. You need not say the sentences to yourselves. Indeed, if you will read the material through rapidly and think about it and then read it over again rapidly, you will make a double gain, because you will cultivate habits of fluent reading and will, at the same time, gain time for thoughtful consideration of the matter under discussion.'

"When one sees the utterly unstandardized results exhibited in such tables as have been reported thus far in this monograph, one cannot escape the conviction that pupils have been left to work out their own devices of meeting the demands imposed on them in preparing their lessons through reading. One cannot escape also the conviction that there is a deplorable conflict between reading and study rather than a wholesome adjustment of reading to the complex demands which come in the higher forms of reading. There is a striking slowing-down of reading with every demand that savors at all of careful reading. It is only the passage of fiction and the easy narrative read without directions which seem to go forward with reasonable expedition. The serious forms of reading require from seven to ten fixations per line. This number of fixations indicate beyond question, clumsy or at

least laborious reading. When one considers the number of fixations that would be saved in an hour of reading if the average could be reduced even by so little as one-half a fixation per line, and when one recalls that reduction of the number of fixations is the most common effect of increased training, one can hardly refrain from criticising severely the schools which neglect to give lessons in silent reading."

Analytical Study of Subject Matter as Contrasted with Reading

What is the character of the reading attitude and the mental process when the pupil endeavors, in perusing a passage, to analyze the grammatical structure, to evaluate the style and to subject the material to other similar critical examinations? Is the mental process different from that which occurs in the ordinary reading situation or even in any of those previously discussed? Here again the results of the research of Judd and Buswell throw an interesting light upon the problem.

In the various reading situations investigated in the foregoing experiments, there were introduced changes in the type of subject matter and changes in the kind of attention. But the primary aim was

always to extract meaning from the printed page. The situation was now varied by requiring the reader to attend to factors other than the simple meaning. An illustration of such division of attention in its rudimentary form is found in oral reading. For, part of the conscious attention is withdrawn from the meaning side and devoted to such secondary factors as the correct pronounciation, suitable emphasis and inflection, and other vocal maneuvers. Proof reading offers another illustration, but one in which so large and dominant a share of the attention is focused upon certain characteristics of printed matter that the grasping of the meaning is apt to be seriously impaired.

Fluent, Straightforward Reading is Sidetracked in Analytical Study.—Much of the reading in the high school places the emphasis not upon the straightforward interpretation of the meaning of the passage but upon matters of diction and rhetorical form. The high school prides itself in directing the attention of the reader to these subtler values rather than to the content, the interpretation of which constitutes the burden of reading in the elementary grades. Figures of speech, niceties of diction, and structural form, receive the chief stress in the study of the English classics and of foreign languages. The highly analytical study of litera-

ture increases as the student progresses through the high school and constitutes an impressive part of his curriculum. Reading in the ordinary sense of straightforward interpretation of the thought is sidetracked. This does not imply that the analytical study of literature is without its own set of values. The purpose is simply to draw a clear cut distinction between the two types of reading attitudes and the differences in the mental processes involved. This will enable the school to establish the proper technique of training for each of the distinct situations, instead of erroneously assuming them to be identical, and giving one uniform type of training for both.

Five pupils, four from high schools and one from a junior college, were requested to read from the introductory paragraphs of the story of Aladdin in the *Arabian Nights*. Different reading attitudes were induced by giving different directions as to what they would be expected to reproduce after each reading. The pupils were requested to do such tasks as: answer factual questions on the text, reproduce unusual words that occurred, "pay particular attention to correct pronunciation and good emphasis" in the oral reading, to "dictate to the phonograph everything you can remember," to "paraphrase the passage," to "pick out the transi-

tive verbs which have objects," and to reproduce the passage verbatim.

A record of one of these subjects, typical, in a general way, of the differences in ocular behavior and mental processes that are induced by various types of reading as analyses, is presented in Table 8.

Table 8

Record of a Subject in Various Types of Reading and Analysis (From Judd and Buswell)

Types of Reading and Analysis	Average Number of Fixations per line	Average Duration of Fixation Pauses
1. Simple oral	9.3	7.6
2. Silent—questions	8.4	6.1
3. Peculiar words	14.9	6.6
4. Emphatic oral	11.7	6.8
5. Silent—dictate ideas	5.6	6.1
6. Paraphrase	29.2	8.5
7. Verbs	20.1	7.1
8. Silent—verbatim	10.1	7.7

Table 8 is to be read thus: In (1) simple oral reading, the subject averages 9.3 fixation pauses per line, with an average duration per pause of 7.6/25 of a second. In (2) the silent reading of the same selection, with the necessity of answering questions on the material read, the subject averaged only 8.4 fixations per line, with an average duration of 6.1/25 of a second, etc.

The records of the subject reveal the different eye-movement habits and the different mental processes which the varying reading situations evoke. In the passage which drew the attention to the unusual words, to the emphasis on enunciation, to the attempt at paraphrasing, and to the transitive verbs, the long duration of the fixation pauses clearly indicates that some mental activity other than simple reading was occurring. While the eyes remained fixated on a word, the mind was engaged in operations which were only indirectly related to the fixated word. This was particularly evident in the paraphrasing. The excessive number of pauses and regressive movements show that while the eyes were wandering among the words, the mind was groping about for synonyms and suitable phrases. The mental process here was not primarily the recognition of words but the search for synonyms and phrases, which began after the process of simple recognition had ended. In view of the extensive wandering of the eyes back and forth over the words, it is difficult to call paraphrasing a form of reading.

A record of the eye-movements of one of the subjects while attempting to paraphrase a line is presented in Plate VII. Since the movements are

so extremely complicated however, another manner of showing the ocular behavior on this line is presented in Plate VIII. In accordance with the general evidence, ten letter spaces, six to the right and four to the left of the point of fixation, are estimated as the approximate range of clear vision. The space between two words is considered as the equivalent of a letter. Plate VIII shows the visual

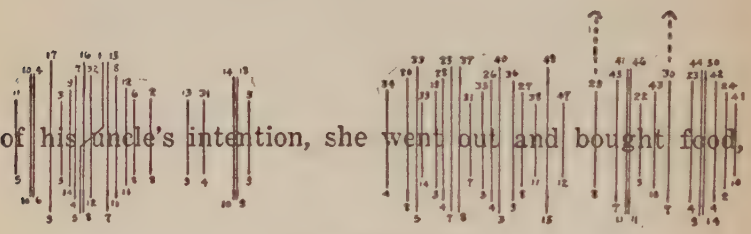


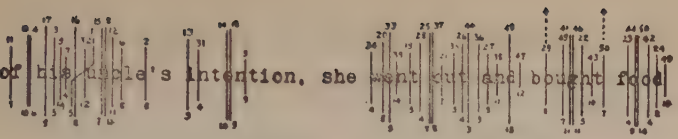
PLATE VII

RECORD OF EYE-MOVEMENTS OF A READER WHILE ATTEMPTING TO PARAPHRASE A LINE (FROM JUDD AND BUSWELL)

content of each successive fixation at different levels. A glance at this plate will convince the reader that the groping among the words as there depicted, cannot, by any stretch of the imagination, be properly labelled "reading."

Conclusions.—The practical pedagogical corollaries which the investigators draw from their experimentation on this point are the following:

"The practical lessons which issue from this



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study of grammatical analysis and its nature are of profound significance for the school. If one asks about the directions which teachers give the pupils in most of the exercises of the school for the purpose of controlling their reading, one finds that a very large fraction of the reading is, in fact, looking for something on the printed page. Looking for something is doubtless very different in different cases, but it is always more or less of an analytical matter and, just in so far as the mental process becomes analytical, it departs from the typical behavior of reading.

"It is altogether probable that the constant emphasis of the schools on analytical reading may set up a general tendency in the mind of the pupil to feel that he is not doing his duty by a book unless he is perusing it slowly and laboriously and in a fashion which aims to find something in the passage other than the straightforward meaning. Most schools assign lessons of such brevity as to make it clear that pupils are not expected to do much reading. The time is then occupied in class in searching every nook and corner of the line for curious rhetorical or historical intricacies. In the meantime, the valuable habit of reading in a straight-ahead fashion suffers by disuse and by a series of involved distractions which bring into the

reader's experience almost every other possible form of thinking.

"Such a consideration of the contrasts between different types of reading leads directly to numerous pedagogical maxims. First, teachers ought to know in every case what they are teaching. Thus, the teacher of literature ought to know whether she wants her students to read belles-lettres or to make analyses of the text with the aid of references to the classical dictionary. Second, teachers should know what method of training to adopt if they want pupils to cultivate certain classes of habits. For example, it is folly to expect the type of reading which leads to literary appreciation during an elocutionary exercise in which the chief channels of nervous excitement lead to the vocal cords. Third, teachers should understand that reading habits set up under conditions which constantly and repeatedly demand elaborate grammatical analyses are not likely to be productive of fluent, progressive reading."

Stressing as the fundamental pedagogical applications of the whole study, the investigators conclude by saying: "So long as teachers fail to discriminate between different forms of reading and different forms of analytical study, pupils will adopt a purely accidental method. Fortunately, some are forced by circumstances to adopt intellectual

methods which are highly advantageous. Others, unfortunately, never acquire fluent habits. They are, from the nature of the case, uncritical of their own methods, since there has never come into their experiences any demand for improvement. They are utterly unguided because it has never occurred to teachers to train them for the different kinds of analytical tasks and forms of reading. Since here, as elsewhere in the world, the chances of going wrong are more numerous than the chances of going right, the great majority, even of mature and otherwise well-trained people, exhibit some lines along which they are peculiarly incompetent.

"What is needed in the educational management of young people, is first of all, a clear understanding of the special demands of each type of reading and the special methods of each type of analysis. When teachers are clear on these matters, there will rapidly accumulate through school practice satisfactory methods of dealing with each situation."

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. Describe the experiment conducted to determine the adjustments in reading caused by changes in the character of the subject matter.

2. Different types of material produce what changes in the visual span? In the duration of the fixation-pause?

3. What are the various adjustments which a pupil can make when confronted with passages of increasing difficulty?

4. In general, what are the characteristics of the eye-movement habits in reading easy fiction? In reading rhetoric? Geography? Blank verse? Algebra?

5. What is the significance of changes in eye-movements?

6. Describe the complexity of reading patterns. Contrast them with the old traditional concept of a uniform reading pattern.

7. What are the corollaries of practical pedagogical consequence deducible from the investigations of reading adjustments to different types of material?

8. What are the adjustments in reading due to changes in the attention? Describe the experiments conducted to answer this.

9. Why is there a need of greater flexibility in adapting methods of reading to different purposes? How may this flexibility be attained?

10. Compare fluent reading with the type of analytical study frequently induced by the school.

11. What are the pedagogical corollaries deducible from the investigation of analytical study of subject matter as compared with reading?

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CHAPTER VI

THE READING OF FOREIGN LANGUAGES

What is the mental process which occurs when the pupil essays the reading of a foreign language? Is the mental set, the conscious pattern of attention, sufficiently similar to those that obtain in the perusal of the vernacular to justify the use of the word "reading" as descriptive of what really occurs? Or is the interpretation of a foreign language a radically different type of organized attitudes and behavior, as different from normal reading as flying is from walking? If there exists fundamental differences of mental procedure, what are these differences? It is obvious that the answer to these questions affords the teacher needed psychological distinctions and a general factual basis upon which to devise, in an intelligent manner, effective methods of teaching.

This necessary information, Judd and Buswell endeavored to secure through scientific investigation. The two best students in foreign languages and the two best Latin students from the junior

class of seven first-class high schools in or near Chicago were chosen as subjects. They were requested to read passages (1) in English, (2) mixed selections containing in some cases French words and phrases, and in other cases Latin words and phrases, and (3) pure French or Latin selections. The third year in the high school was chosen because pupils would then certainly be far beyond the rudiments, and because the investigations of H. A. Brown point to the third year as crucial. Only the best students were selected, because the aim was to study not the stages of immaturity through which pupils pass, but a somewhat mature type of foreign language reading. In order to secure a background for the investigation of the reading of French and Latin by high school pupils, records were first made of the reading of these languages by mature graduate students. The records of these students show that the method of reading is substantially comparable to the method of reading the vernacular.

The records of the high school students in reading the mixed passages reveal on the whole a greater expenditure of effort, more and longer fixation pauses when the subjects encounter the foreign words in the English passage. In most cases the

words were successfully deciphered, the general sense of the passage helping to indicate the meaning of the occasional foreign phrases.

Reading of French Shows Great Difficulties Are

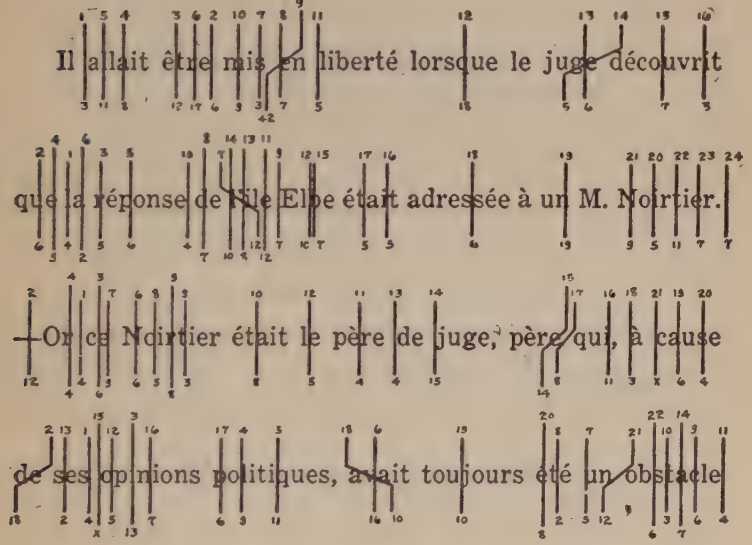

Il allait être mis en liberté lorsque le juge découvrit
que la réponse de l'île Elbe était adressée à un M. Noirtier.
—Or ce Noirtier était le père de juge, père qui, à cause
de ses opinions politiques, avait toujours été un obstacle

PLATE IX

RECORD OF A SUBJECT TRANSLATING ORALLY A FRENCH PASSAGE
(FROM JUDD AND BUSWELL)

Encountered.—The records of the French reading show that much greater difficulty was encountered, and necessitate to a marked degree an analytical attitude of mind. Especially is this true of the

oral translations of French passages into English. A glance at the record of a pupil translating orally a French passage shows that the reading is noticeably labored, complicated by many fixations and numerous backward movements. Such a record is presented in Plate IX. In main outline and in general character, however, it is sufficiently similar to the eye-movement habits in vernacular reading to justify the use of the term "reading."

Reading of Latin is Metamorphosed into Analysis.—The case is otherwise with the Latin reading. Here the results show that the reading is metamorphosed into analysis, similar to that evidenced in the paraphrasing discussed in the preceding chapter. The number of fixations is extreme. The frequency of the regressive movements indicates a sort of helpless wandering among the words that completely overwhelms the effort to read. A cursory glance at a typical effort to read silently a simple Latin passage, as presented in Plate X, clearly shows that by no stretch of the imagination can the performance be called reading. The attempt to read breaks down completely as these Latin hieroglyphics confront the helpless eyes of the student. The ocular behavior, the mental attitude, the tension of the central nervous system, the pattern of

conscious attention, are as different from those that obtain in normal reading as the attitude of the swimmer is different from that of the walker.

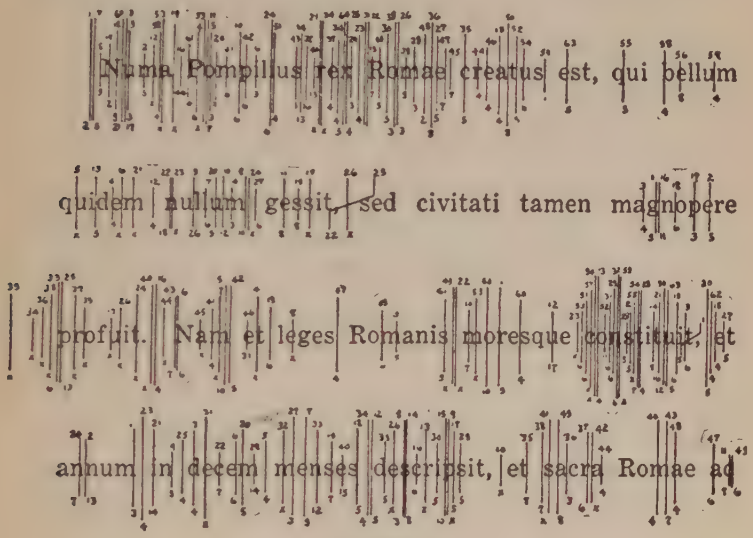
A statistical record of the eye-movements of a subject reading silently two English passages in

Numa Pompilius rex Romae creatus est, qui bellum
quidem nullum gessit, sed civitati tamen magnopere
profuit. Nam et leges Romanis moresque constituit, et
annum in decem menses descripsit, et sacra Romae ad

PLATE X

RECORD OF A SUBJECT READING SILENTLY A SIMPLE LATIN PASSAGE (FROM JUDD AND BUSWELL)

which some Latin words were interspersed and one pure Latin passage of first year type, is presented in Table 9. A specimen of the attempted Latin reading of this subject is shown in Plate X.

Table 9

Record of Subject A29 in Silent Reading of Mixed Passages and a Latin Passage

Silent Reading	Average Number of Fixations per Line	Average Duration of Fixation Pauses
First mixed	16.7	5.8
Second mixed	39.1	6.9
First Latin	45.4	7.2

One can only speculate on the character of the conscious processes which constitute the counterpart of the eye-movements recorded in Plate X, showing the attempt at reading. But one does know the chaos that results in his own thinking when his eyes roam aimlessly back and forth, in and out, among the words of a line of English.

This prima facie evidence offered by the photographic records is confirmed by the defective efforts at translation. No passable translation was made of even the simple passage from Cæsar.

Conclusions.—As a result of their investigations of this type of attempted reading, Judd and Buswell draw the following practical pedagogical conclusions:

"The significance of these records is not difficult to discover. Latin students are not taught to

read. They are trained only to look at words. Not only so, but they are so trained to look at words that it is quite impossible to find any system in their looking. There seem to be no mental devices in their experience for disentangling a complex of Latin words. Of course, the chief instrument used for this purpose in ordinary school work is entirely withdrawn in these experiments. The student usually depends on the vocabulary at the end of the book for help in translating Latin. From the beginning of his study he is encouraged to use the vocabulary rather than to attempt to carry anything in his mind. The result is that when the vocabulary is withdrawn the world looks like a great confusion.

"When series of fixations in apparently chaotic order were first encountered by experimenters dealing with photographs of eye-movements of children who were just beginning to read, someone invented the phrase 'periods of confusion' as a descriptive name for the aimless attack of the baffled child who does not know how to solve the mystery of some unintelligible word. 'Periods of confusion' will not serve in this case because the confusion is pervasive and permeates whole lines and even whole passages.

"Indeed, we have come to these extraordinary

exhibitions of forward and backward movements gradually enough so that it is possible to understand their meaning. The numerous irregular movements of the eyes show that the subject is trying to break up the situation into elements. If he were dealing successfully with the reading matter and were able to extract meaning from the words before him, he would move his eyes in steady, progressive, forward steps. But he is not successful; hence he must go back and forth in the attempt to analyze. Again, if his analysis were successful, he would, to be sure, be delayed by the exacting demands of analysis, but he would ultimately make progress. The evidence is clear that analysis is not successful in these cases. The reader does not know what the elements mean, and ultimately his eye-movements take on the character of mere helpless wandering.

"Latin teachers can hardly escape the responsibility for such an exhibit of wasted human effort. It is not possible to believe that the effects of such mental wandering are good for the student. It is quite impossible to look with any complacence on the mental and nervous disorganization which seems to be the major outcome of two and one-third years of training of Latin students in seven high schools of the first rank.

"One's imagination halts before the problem of

picturing what must be the eye-movements and the mental state of the students at the bottom of the class."

PEDAGOGICAL COROLLARIES OF PSYCHOLOGICAL DISTINCTIONS

Effective Methods of Teaching Are Based upon Psychological Distinctions.—Flowing from the scientific experimentation previously discussed and from the psychological distinctions which resulted therefrom, are certain concrete suggestions of practical consequence to the teacher who is desirous of refining and improving the technique of her teaching of reading. Educational psychology does not devise teaching methods, but it does present the solid foundation upon which the student of methodology can safely build. Progress in practical school methods is, therefore, largely dependent upon the rapidity with which the educational technician avails himself of the psychological distinctions and general data resulting from scientific experimentation.

Spelling and Reading were Formerly Confused.—There was a time in the history of primary methods when reading in the early grades was largely confused with spelling. In the days of Noah Webster,

the speller and the reading book were one and the same. The failure to make the psychological distinction between reading and spelling was responsible for an enormous expenditure of poorly directed human effort and for deplorable results. A perusal of the reports of Horace Mann shows that the status of reading in the upper grades of the schools of Massachusetts was closely akin to the state in which Latin reading is in the high schools of America today. The all-important distinction between spelling and the reading of words in the sense of deciphering not merely their auditory elements but also their meaning, which was introduced by Horace Mann and his co-workers, was responsible for bringing order into the chaos of primary reading methods. Methods were formulated for the teaching of reading which were distinct and different from those used in teaching spelling. The two subjects thus came to occupy two separate places in the curriculum and to be taught at different periods in the day. A vast improvement in the teaching of both branches resulted.

Distinction Between Reading and Phonetics.— Closely akin to the above distinction is the one to be made between the teaching of reading to secure the thought of the passage, and the training which imparts a knowledge of the differences in word

form and in their phonetic properties. There has been a tendency in some primary circles to consider the teaching of reading as complete when the pupil has learned to grasp the meaning of short simple words. This may satisfy the demands as long as the pupil encounters only such simple word forms; but when he advances beyond the primary grades and encounters many complex words, he finds himself overwhelmed. He needs the equipment which will enable him to analyze the complex word forms into their constituent elements. This he can do only through training in phonetics. The distinction between training to interpret the meaning of words, and training to master differences in word forms and in their phonetic element, is as fundamental as the distinction between reading and spelling. Both types of training are ultimately indispensable.

Perception—Visual and Auditory.—There is also the distinction to be made between words as sound and as objects seen. In the course of time, numerous interrelations and connections are built up between the visual and auditory centers in the brain. But the fact to be recognized by the primary teacher is that the pupils bring to the school a rich auditory vocabulary, steeped in meaning as a result of their pre-school training. To supply the visual words with rich vivid meaning, the primary teacher must

skillfully associate the former with their auditory counterparts, so that ultimately whether the word be presented as a visual or as an auditory object, the vital, vivid meaning occurs.

Relation of Articulation to Meanings.—A further fact which studies in modern behavioristic psychology disclose is that associations are built up not only between meanings and words visually or auditorily apprehended, but also between meanings and articulation. There are instances in the primary grades where the articulation of a familiar word engenders a wealth of feeling and a vividness of meaning which the mere seeing or hearing of the word can by no means duplicate. When certain words, visually or auditorily presented, seem to yield only a meagre content of meaning, the wise primary teacher will fall back upon the occasional use of articulation to enrich the vividness of feeling and strengthen the meaning reaction. Articulation is, therefore, not without its own rôle of service in the teaching of reading in the primary grades.

Psychological Distinctions Afford Basis for Different Pedagogical Methods.—The distinctions between the types of reading attitude, mental set, and conscious mode of organizing visual impressions in the process of interpretation, which result from different kinds of subject matter and from changes

in the attention due to the different purposes for which the reading is done, are likewise of major consequence to the teacher. The discriminating teacher will turn these psychological distinctions to her profit by devising different types of training to meet the radically divergent situations disclosed. The undiscriminating teacher will continue to lump them all blindly together and apply one uniform type of drill in a primitive "hit or miss" fashion which turns out chiefly to "miss" the points needing attention. The procedure is similar to the action of the man who, hearing his machine groaning articulately for oil, pours it over the whole surface of the machine, hoping that in some vague mysterious manner it will reach its proper destination, instead of applying it in an intelligent manner directly to the joints that squeak.

Need of Specific Technique for Different Types of Subject Matter

The working out of different methods of training to read material in mathematics, in geography, in history, and in other kinds of subject matter, together with a technique of training to read for the answering of factual questions or critical analysis of the style, and for a variety of purposes is needed

at the present day. It offers an alluring and fascinating opportunity to the teacher to render a distinct contribution that shall enrich the labors of her colleagues. It is practically a virgin area in the special field of the methodology of reading. The teacher has the same urgent need for a book which will disclose the specific remedies for different reading ailments, that the physician has for his indispensable book on specifics revealing the particular antidotes for different physical maladies. It is only by patient investigation and systematic experimentation and the careful sifting of results that practical methods will finally be formulated which will provide adequate training in the different mental processes which different reading situations necessitate.

Reading and Skimming.—A significant distinction which is worthy of the teacher's attention is the one to be drawn between reading and skimming. In this day of voluminous reading material, an individual at best can come in contact with but an infinitesimally small fraction of the total output. The ability to go through an article rapidly and gather only the items in which one is interested is of immense practical value. This is an ability that obviously needs to be cultivated by pupils after they have acquired some maturity in reading. For the practice of

skimming is apt to be dangerous to the immature reader who is all too prone to skip words and phrases that prove difficult to him. Further experimentation is needed here to determine practical methods of teaching to skim and also the most advantageous time in which to inagurate the practice.

Change in Methods in Passing from Primary through Intermediate Grades.—Concerning the change in the types of methods of teaching silent reading as the pupil passes from the primary through the intermediate grade, Judd and Buswell make the following significant observation:

"Teachers have known for a long time that the process of reading fluently to oneself requires a long period for its perfection, but teachers have not known much about guiding the pupil while he is passing through this period. In fact, the years during which silent reading is maturing have been treated as though they were years of formal and uniform drill. One reads in the books of methodology the statement that the fifth and sixth grades should be devoted to drill in order that the habits acquired in the primary grades may be thoroughly fixed. Such a statement is utterly misleading. Nothing could be less desirable than that the habits cultivated in the primary grades should become fixed. Most of the primary habits are in the nature

of intellectual scaffolding and will have to come down sooner or later. Primary habits should be superseded by mature habits. The fourth grade and the subsequent grades are fruitful periods of education if teachers recognize the unique psychological adjustments that these grades have to work out. To lump together all of these significant adjustments under the blind word "drill" is to attempt to define a complex psychological epoch by a simple, formal name. What school methods will have to do is to break up the word "drill" into a number of separate kinds of happenings. These happenings will be first distinguished by the discriminating mind, but once they are distinguished, the methodology of these grades will be determined, and the reasons for the variety in methods will become common traditions in the schools.

"If one may hazard a general practical conclusion on the basis of the material which has been collected in this monograph, one may distinguish the fourth, fifth, and sixth grades from the primary grades by assigning to the latter training in intelligent oral reading, with gradually increasing emphasis on silent reading. There must be throughout emphasis on apprehension of meaning. To the fourth, fifth, and sixth grades may then be assigned the task of cultivating fluent silent reading of various types

in preparation for later elaborate forms of analytical study. The grades immediately above the primary should, under this distinction, be grades of much reading of a variety of material. There will, perhaps, be a period of extensive reading of biography with suggestions as to the items for which one should look. There will, perhaps, be another period when pupils will find out the best ways of getting at scientific materials and absorbing them. There will be a period of training in the reading of mathematical material. This statement should be taken literally as a suggestion that some one write an interesting book on arithmetic intended really to be read. There will be no difficulty in finding many other like topics with which to fill a fruitful program for the reading of the middle grades if teachers will once begin to think in terms of silent reading and its different forms."

Type of American Textbook.—A serious obstacle to the development of habits of fluent silent reading is encountered in the character of the ordinary American textbook. An inspection of the average textbook shows that it consists largely of abstract statements, lists of items, outlines, summaries and other materials that are more adapted to analytical study than to fluent reading. The assumption underlying such construction is that the informing

details and explanations will be filled in by the teacher during the recitation period. But as this latter period is seldom a time for reading, the fact remains that the average American textbook, as written at the present day, necessitates a type of minute analytical study which hinders and retards the development of habits of fluent silent reading.

Library Reading Material.—Relief from such hindering influences is found in a practice which in recent years is becoming more widely prevalent—the practice of encouraging the student to secure his information from library reading material. The more extensive use of the library method of getting an education is calculated not only to encourage fluent silent reading in contrast to the detailed analyses which most textbooks require, but also to effect wholesome modifications of far-reaching importance in school methods. The development of a technique for the systematic cultivation of suitable library reading material will tend to render the practice more widespread.

The development of a technique for the cultivation of the most economical forms of analytical study is also needed. While emphasis has been placed upon the necessity of distinguishing sharply between fluent silent reading and analysis, as two distinct types of mental procedure, there is no implication

that the latter type of study should be eliminated. Indeed it plays a very legitimate rôle in the work of the pupil and is indispensable. But the cultivation of both fluent silent reading and analytical study can proceed more effectively when different types of training and different kinds of subject matter are employed.

The English Classics.—The confusion of analysis with reading has resulted to the disadvantage of both. Thus, in the high school, the English classics are ostensibly read to give the students an insight into the best social traditions and ideals of the race. But in reality they are prostituted to the uses of grammatical dissection and stilted formal rhetoric, until in the eyes of the students they bear a closer resemblance to the dead bones of an anatomized skeleton than to a living expression of the immortal aspirations and strivings of the race. The classics are literally murdered through excessive dissection and mutilation.

There is ample evidence that all analysis should be omitted until some appreciation of the English classics is gained through straightforward, fluent reading. Even if some details are not grasped in the first reading, the discovery of significance of a classic is apt to yield much greater relish to the pupil when he reads it a second time. The dis-

covery of the significance of passages through much fluent reading is one of the effective methods of promoting the maturity of the pupil's taste for truly valuable literature. The investigation showing the break-down of reading when confused with analysis would seem to justify the following conclusion: "The time ought to come in our schools when there will be much reading of belles-lettres in the school, unmixed with rhetorical pedantry."

The Break-down of Latin Teaching.—The methods of teaching Latin, coming down as a heritage from by-gone days, are overlaid with a deep crust of formalism and crude empiricism. They give little evidence of the infiltration of the data secured through scientific experimentation and through that type of educational analysis which demands that every method must justify itself by its results. The findings of the photographic investigations cast a significant, if somewhat lurid, light upon the results which teachers actually secure while they are ostensibly teaching pupils to read Latin. That the teaching of Latin stands in need of a complete overhauling is evident from the conclusions of these investigators, based as they are upon objective evidence.

"The literary studies which carry the student

into foreign languages present many a complex problem. The results of photographic studies of French and Latin reading and analysis reported in this monograph show in a very striking way how the oldest subject of instruction in our high schools has set an extreme example of a type of treatment wholly opposed to reading. Pupils do not read Latin. One can dismiss as absurd under existing conditions the idea that the ordinary pupil ever gets any literary thrills out of Latin. The whole subject has degenerated into an absolutely formal exercise in linguistic dissection. It is doubtful whether this generation of Latin teachers can be made to understand the extent to which they have ruined their subject. If the war had not put an end to the rapidly increasing study of German in the schools, it is doubtful whether Latin could have saved itself, even by this date, from the fate which has overtaken its companion, Greek.

"It is nothing less than preposterous for schools to consume the time of students and leave them with the handful of ashes that Latin gives them in its present third year. Latin has lost its vitality. It is a series of barren exercises in analysis of grammatical forms; students are kept busy in the mere piecing together of English words picked out one

by one from a vocabulary. It is the example par excellence of lean years of analysis that have fed without profit on all of the accumulations of a child's intellectual life.

"It would be less harmful to the school if Latin could be isolated and treated in terms of its own decline. But under existing conditions, it is a source of contagion to the whole school. Latin dominates all of the literary subjects and by its methods contaminates the procedure in every class where its influence is felt. There is a stiff and rigid analytical formalism in much high-school work because teachers in the literary fields think they must be as Latin teachers are.

"There must be a time in the study of a language when students and teachers alike want to get some meaning from the text. The French teachers may not be perfect in their art, but the French students show that they are able to read and that they are interested in the story told by the French words. French teachers have had a hard time emancipating themselves from the Latin traditions. Some of them have not yet achieved liberation, but the time is coming and seems to be at hand when the French teachers will take one fork of the road and leave the Latin teachers to go their lonely way."

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. What are the fundamental differences between the reading of the vernacular and the reading of foreign languages? Describe the experiment conducted by Judd and Buswell to determine these differences.

2. What are the characteristics of the eye-movement habits in the reading of French? What kind of mental attitude is induced?

3. What are the characteristics in the eye-movement habits in the reading of Latin? Outline all the differences, physiological and mental, between the reading of the vernacular and the "reading" of Latin.

4. What pedagogical conclusions follow from the investigation of the attempts to read Latin?

5. Why is progress in practical school methods largely dependent upon the utilization of psychological distinctions and the results of scientific experimentation?

6. In the days of Noah Webster, what was the relation of reading to spelling?

7. What is the distinction between reading and phonetics? What is its importance?

8. Why is there a need of a specific technique for different types of subject matter?

9. Discuss the values and the dangers of skimming.

10. Why should there be changes in the methods of teaching reading as the pupil passes from the primary through the intermediate grades? What should be the character of those changes? Why?

11. What are the wrong uses to which the English classics in the school have been prostituted? What are the evil effects upon reading habits?

12. Discuss the break-down of Latin teaching. How has the

teaching of Latin affected the teaching of other literary subjects? What is the remedy you would suggest?

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CHAPTER VII

CHARACTERISTICS OF ARITHMETIC READING

Reading is not a uniform mechanical procedure. There are many types clearly distinct from each other, which have come to be recognized as characteristic of different kinds of subject matter and different purposes for which the material is read. The investigation of Judd and Buswell reveals, for example, the difference in the type of eye-movement habits in the reading of Latin and of French, of easy fiction and of algebra. A glance at the photographic records of the ocular behavior in these cases shows that different methods of attack are employed in deciphering each type of material. These investigators emphasize the importance of securing through scientific experimentation an accurate knowledge of the different types of eye-movement habits which are called into play by different kinds of subject matter. The conclusion is drawn that this knowledge will then serve as a basis upon which the teacher can construct, in an intelligent manner, effective methods of training pupils to read different

kinds of subject matter. Just as studies in psychology have demonstrated that what was previously regarded as the general memory must be analyzed into special memories, in order to proceed intelligently, so likewise the results of recent research have shown that what was formerly regarded in a vague way as a pupil's general reading ability must be broken up into groups of special reading abilities.

Arithmetic Reading Has a Distinct Pattern and Technique Peculiar to It

Terry [1] has contributed the most detailed analysis that has yet been made of the reading of arithmetic problems. The results of his investigation show that the reading of arithmetic material is not simply one manifestation of a general reading ability, but that it is distinct and different from the reading of other subject matter and has a specific technique of procedure which is peculiar to it. Terry's investigation was focused particularly upon the reading of numerals, both as embodied in problems and in isolation, since it is numerals that constitute the chief characteristic of arithmetic subject matter.

[1] P. W. Terry, *How Numerals are Read*, Supplementary Educational Monographs, No. 18, June, 1922, University of Chicago Press.

A brief statement will be given not only of the chief results of Terry's investigation but also of some of the methods employed. To the alert, progressive teacher the latter is significant as well as the former. For the time is rapidly approaching when the scientific methods employed hitherto almost exclusively by the student in the laboratory, may profitably be made available for the teacher. Even though some modification of the methods may be necessitated by the exigencies of the classroom, the description of the scientific mode of procedure is apt to stimulate the teacher to careful analysis and fruitful checking of the results of her own work and thus further the advancement of educational methods.

The first part of the study sought to ascertain what the reader does when he encounters numerals in reading simple arithmetic problems. Accordingly, seven simple arithmetic problems, with numerals of various digit-length, were placed before ten graduate students of the University of Chicago. They were directed to read the problems in their usual manner and then solve them, being careful to preserve from beginning to end the problem-solving attitude. After solving each problem they were requested to write down immediately their experiences with reference to the reading of the nu-

merals in the problem. After the solution of the first problem and the describing of the method of reading the numerals, the subjects found the task of noting the experiences accompanying the reading of the numerals grow easier with each successive problem. The method is the simple one of careful introspection—available not less to the teacher in the classroom than to the scientist in the laboratory.

Partial First Reading and Re-reading.—The most striking fact revealed by the record of the subjects was that the reading of arithmetic problems is divided into two distinct phases, the partial first reading, and then the re-reading. As a result of their introspection, the subjects discovered that their habitual procedure was, first, to read through the entire problem, "to get the sense," or "to see what was to be done with the numbers," and secondly, to re-read the numerals and occasionally a few of the accompanying words. During the first reading, as a rule, but a minimum of attention is given to the numerals, the mind apparently seeking to be unencumbered with the details in order to think through the solution of the problem. The preliminary reading is lacking in details and in precision, and apparently merely attempts to ascertain what is to be done with the numerals embodied in the text.

The second reading, in which the numerals were the objects attended to, was found to be for such purposes as "verification," or the "cultivation of assurance" before the figures were copied on to a paper for computation. The experiment also brought out the curious fact that, prior to the introspection, the subjects, with one or two exceptions, were unaware that their reading of arithmetic problems consisted of such two distinct phases as a general rapid preliminary reading of the problem text, followed by a re-reading of the numerals.

Conclusions.—From this phase of the investigation, Terry draws the following conclusions:

1. The subjects distinguished two phases in the reading of problems, namely, a first reading and a re-reading. The purpose of the first reading is to discover the conditions of the problem, while that of the re-reading is to perceive the numerals accurately for use in computation.

2. Two ranges of perception of numerals during the first reading are distinguished, namely, whole first reading and partial first reading.

3. Shorter numerals and very familiar numerals more frequently receive whole first readings, whereas longer numerals more frequently receive partial first readings.

4. The first numerals in problems which have numerals of three to seven digits in length, are commonly given whole first readings.

5. When as many as four numerals appear in a problem they receive a greater proportion of partial first readings than in those cases in which only two numerals of the same digit-length appear.

6. Subjects differ widely in their habits. Some are predominantly whole first readers, others are partial first readers.

7. Numerals of all lengths and types, when they are used in computation, are very generally re-read for computation.

8. All subjects persistently re-read numerals when they begin to use them in computation.

Photographic Records of Arithmetic Reading.— Besides employing the method of introspection to ascertain the manner in which arithmetic problems containing numerals were read, and the experiences accompanying the interpretation of the problem, Terry also had recourse to photographic records of the eye-movement habits in such reading. One of the problems which was attacked by means of these objective records of ocular behavior, was: "Did the two elements of which the problems are composed, namely, the numerals and the accompanying words, make equal demands upon the attention of the individuals who read them in this study? An analysis of the records shows that in the reading of all the subjects, the numerals necessitated the use of a smaller visual span than the words. The smaller range of perception for numerals than for words is probably traceable to the fact that "digits in numerals do not appear in the same combinations as do the letters in words. In consequence, the numerals in their continually new combinations of

digits make larger demands upon the attention of readers. Every individual digit is significant in itself and must be noted; and all of the digits must be viewed in combination before the numeral is completely read. Words, however, as several investigations of the span of perception have shown, are perceived as wholes. The letters appear and reappear in the same regular combinations, which become familiar in the earlier years of schooling. Readers have become accustomed to them as words and are able to proceed easily with whole words as units of perception."

Not only do numerals necessitate the use of a narrower visual span than the words, but they also require a longer average fixation pause than words. Terry found that the average fixation pause for his subjects in the reading of numerals was 40 percent longer than the average fixation pause for the reading of words. This greater duration is due to the greater demands made upon the eye of noting carefully each of the component digits of the numeral, and their respective locations in the numeral whole—demands which are not made in the reading of words, which are read as word-wholes and not letter by letter.

Conclusions.—Among the conclusions which

Terry draws as a result of his study of arithmetic reading by the photographic method, are the following:

1. Shorter numerals are given whole first readings almost invariably. Longer numerals, on the other hand, are given whole or partial reading according as the subjects who read them are whole or partial readers.
2. The partial method is more economical than the whole method in point of total time required to read the numerals during the first reading of a problem.
3. The subjects who read the ordinary prose selection more rapidly use the partial method of reading the longer numerals for the most part.
4. Partial first reading of numerals is probably learned empirically as a method of more rapidly disposing of the numerals in reading. The essential characteristics of the method are skipping the details of a numeral and recognizing only the most outstanding facts concerning it.

Practical Applications to Classroom Teaching.— Among both teachers and pupils, arithmetic is generally considered to be one of the most difficult subjects in the elementary school curriculum. The expenditure of such large amounts of time and effort, not infrequently of an almost painful character, with such meagre returns in comparison, has been a matter of frequent complaint. Some relief has been secured by improving the selection of subject matter, rendering the problems more practical, and by the elimination of material seldom used any longer in modern business. Can additional relief

be secured by increasing the facility of reading arithmetic material? The results of this investigation point to an affirmative answer.

Reading is essentially the gathering of thought from the printed page. When the subject matter is difficult, the reader must make a careful, patient, and systematic search for the meaning. Instead of this, the children in the grades are inclined to resort to the mechanical pronunciation of the words, to scanning of the printed line, or to skipping over entirely the troublesome places. In case the material be an arithmetic problem, no solution is possible in such cases, because the meaning of the problem has not been grasped. It is the experience of many teachers that the number of pupils even in the upper grades, who have developed a rapid, skillful method of attack in reading arithmetic problems, is comparatively small.

Now difficulty in arithmetic material is traceable not only to the presence of numerals of varying sizes in the text, but also to the necessity of deciding what is to be done with such numerals. It is the opinion of many teachers that it is in this latter phase that the chief obstacle to the facile reading of arithmetic problems is to be found. It seems to be the general conviction of teachers that it is easier to teach the mechanical computation of figures

than the interpretation of the solution of the problem. Despite the widespread character of this conviction, studies in the psychology of arithmetic have been focused almost entirely upon the operation of computation while the processes of interpretation have been largely overlooked. Here is the virgin field awaiting the hand of the investigator—a field which, when cultivated, will yield rich results for the teachers of arithmetic.

Analysis of Arithmetic Problem Complex.—While exact knowledge of the interpretative processes in connection with the solving of arithmetic problems has not yet been furnished by scientific research, yet some "efforts have been made," says Terry, "upon the basis of common observation to describe the reading situation which a problem offers and the preliminary thinking about it which is necessary before the reader is prepared for the work of computation. The most essential characteristic of a problem is the fact that it presents a series of conditions which describe a certain state of affairs. Some of the conditions appear in precise quantity. The quantities stand in definite relationships with each other and are stated in abstract terms.

"Each of the elements of this complex situation must be comprehended by the student during the

preliminary reading. He must draw in his imagination an accurate picture of the situation, which is described, and take account of each of the facts of relation. Following this, comes a canvas of the plans for solving which suggest themselves, and the passing of judgment on the appropriateness of each plan to the conditions of the problem. The reading processes which are carried on in this manner are analytical in character and call for a high degree of skill and patience, as well as for a certain amount of practical acquaintance with the facts described. It is doubtful if teachers generally have acquired anything like an adequate appreciation of the confusion which children feel when confronted with a situation to be studied in this fashion."

Pedagogical Corollaries

With a view of offering practical aid to the teacher in the training of pupils to develop a rapid, skillful method of attack in the interpretation of arithmetic problems, Terry submits the following recommendations:

1. Pupils should be taught to distinguish between the first reading and the re-reading phases in their attack on problems.
2. They should learn to consider numerals and the accompany-

ing descriptive conditions as different elements of a problem and separable for reading purposes.

3. During the first reading, they should devote their entire attention to the conditions of the problem.

4. At the same time skill should be developed in partial reading of numerals.

5. While this skill is being acquired, pupils should be apprised of the essential similarity between the conditions of the problem and such details of the numerals as are perceived by partial reading.

Terry continues his recommendations: "Although the preceding recommendations were derived for the most part from the finding of this report, their validity does not rest on this basis alone. They derive additional support by comparison with the findings of other investigations in the field of reading. Gray, in summarizing the principles of method which were deduced from recent studies of reading, states that emphasis of the elements on which meaning depends improves comprehension. A closely related principle is stated by Freeman: 'Rate of reading is increased by attending to the meaning as distinguished from the mechanics.' In the case of arithmetical problems, the elements referred to by Gray are obviously the conditions of the problem and such details of the numerals as identity of the first digit and the number of digits. Attention to these items and to these alone is obtained by the use of partial reading as

recommended above. The remaining details of the numerals are of the nature of 'mechanics,' as described by Freeman, and when the partial method of reading is used, the attention of the student is relieved of the 'mechanics' and is free to search out the meaning.

"Further comparisons with the results of other investigations emphasize the fact that the use of partial reading as recommended above represents a more progressive type of reading. Progress in reading, according to Freeman, consists in a decrease of the recognition of each pause. Gray concludes that 'regular rhythmical movements of the eyes are prerequisite to rapid silent reading.' When partial reading is used, the numerals of a problem are not read in detail and it has been shown that fewer pauses are required to get the meaning from the printed line. As a consequence, the average amount of material perceived is increased. It is clear, therefore, that both of the conditions which Freeman describes as representative of progress in reading are encouraged by the method of partial reading. At the same time, by employment of this method, the eye is relieved of the most severe exactions of the numerals and does not suffer the delay in movement which, owing to the nature of numerals as reading materials, is unavoidable when the nu-

merals are read in detail. By virtue of this relief, the eye is able to approximate more nearly the rhythm of movement which is customary for lines of words, and which is 'prerequisite to rapid silent reading.' "

After the pupil has employed the first method of attack, namely, the preliminary rapid perception to ascertain the conditions of the problem, he should then employ the re-reading method, to note the numerals, or verify them preparatory to using them in computation. If the problem is very simple, however, it is wise economy to encourage the immediate direct mental computation of the numerals upon the first reading of the problem.

When Methods Should Be Introduced.—In what grade may the methods of partial reading and re-reading be appropriately introduced? In answer to this query, Terry says: "Partial reading and re-reading are methods of skillful and rapid silent reading. They represent a degree of achievement which is more advanced than mere ability to recognize the words. It is reasonably certain, therefore, that children are not prepared to read in this fashion before the teaching emphasis has been shifted from oral to silent reading, which, as it is now generally known, should be done between the second and fourth grades. Beginning with the latter grade,

progress in reading consists in large part in ability to master increasingly difficult materials. Arithmetical problems with several conditions and with longer numerals constitute such materials and it is this type of problem which is attacked to advantage by the use of partial reading. In the nature of the case, partial reading and re-reading are highly specialized types of procedure. It is during the fourth, fifth, and sixth grades that pupils should be trained to use different types of reading ability. In view of this consideration, and of such others as are named above, it appears that the fourth grade is the appropriate time for the introduction of the new methods."

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. Describe the experiment Terry conducted to determine the character of the pattern in arithmetic reading.
2. What are the two phases in the reading of arithmetic problems?
3. What is the chief purpose of the partial first reading? Of the re-reading?
4. What are the conclusions which Terry draws from the first part of his investigation?
5. What characteristics of arithmetic reading do the photographic records reveal?
6. How would you analyze the arithmetic problem complex?
7. What are the practical recommendations for the teaching of arithmetic reading which Terry makes?

8. In what grades may the methods of partial reading and rereading be effectively introduced?

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CHAPTER VIII

READING DIFFICULTIES: THEIR DIAGNOSIS AND REMEDIAL TREATMENT THROUGH THE USE OF STANDARDIZED TESTS

Scientific Standardized Reading Tests Are Not Mere Measuring Rods.—Modern scientific standardized tests have not infrequently been referred to as "measuring rods" which plumb the depth of a pupil's mastery of a given subject. They are measuring rods and usually something more. For the abilities resulting from a grasp of reading, spelling, arithmetic and the other subjects which are measured by the tests represent complex processes. To analyze these complex responses into their constituent units, and to disclose the accuracy of these single constituent processes, are among the chief functions of effective standardized tests. In thus pointing out the specific points of weakness and of strength in a pupil's mastery of a subject lies the diagnostic value of tests. In the writer's judgment this is their chief value.

The solution of a simple problem in arithmetic calls into play a variety of arithmetical abilities—

the ability to add, to divide, to multiply, to handle fractions, to place the decimal point properly. A wrong solution may be traceable to a lack of ability in any one of these distinct processes. It is helpful to the teacher, as it is to the pupil, to locate the specific weaknesses in order that by proper training they may be overcome. In like manner silent reading ability is the composite of at least two distinct factors, rate and comprehension. To determine in which of these processes the pupil is strong or weak is to render possible the application of the appropriate remedy at the place where it is needed. Some pupils in a class may have good comprehension but slow rate of reading; others may have a rapid rate but be poor in comprehension. It is obvious that what is needed here is not uniform treatment for all the members of the class but different training for each of the two groups to meet the specific weaknesses revealed.

Final Aim of Tests Is to Improve Teaching.—It is because this fact has not always been recognized that teachers have sometimes been apt to look upon standardized tests as mere playthings, whose whole utility ceased after they had determined whether or not their particular classes reached the norms prevailing elsewhere. Standardized tests are not primarily instruments for the superintendent to

check the efficiency of teachers. They have been devised primarily as aids to the teacher herself, to enable her to increase the effectiveness of her own work. The measure of their usefulness will be the degree to which they diagnose the specific weaknesses of the class, thereby affording the teacher a basis for the intelligent planning of remedial instruction. If this effect is not secured from the use of tests, it is a question whether their employment is worth the expenditure of the time and money involved.

The knowledge as to how the class averages or norms of one school compare with other systems is interesting and of some value, perhaps, to a principal, inspector, or superintendent. It satisfies a natural curiosity as to how his school compares with another in attainments. It may show him that a certain class is below standard and may indicate, in a vague general way, that something is to be done about the matter. But unless standardized tests do more than this, unless they get down below the surface and reveal wherein lies the specific weaknesses which have pulled the general class average below the prevailing norms, the teacher, as well as the supervisory officer, is apt to be left very much at sea, as to what specifically is to be done and as to where specific remedial treatment is to be applied.

Unless they diagnose the specific weaknesses and thus furnish valuable cues for the type of instruction needed, standardized tests fall far short of accomplishing the effect which the majority of their authors had in mind in constructing them. Similarly, in medicine, a blood test which would reveal only the general facts as to whether or not there existed the proper proportion of ingredients would be far less valuable than the tests which, in case of a lack of proper proportion, would penetrate beyond this general finding and would disclose the specific element—sugar, or hæmoglobin, or leucocytes—which was there in undue measure.

The Four Steps in Testing

In the use of standardized tests there are four distinct steps which are to be taken before the full benefit derivable from them is secured.

Careful Administration of the Tests.—First, there is the careful administration of the tests in strict accordance with the directions. Failure to follow the directions may render the entire results of the test inaccurate and incomparable with scores secured under the conditions prescribed.

Computation of the Individual Scores and the

Class Average.—Secondly, there is the computation of the individual scores and the class average. The fulfillment of this step discloses how each pupil stands in relation to the others and how the class average compares with the standards for that grade. The pupil is generally interested in discovering whether he is above or below the class average and the teacher in seeing whether her class is superior or inferior to the classes taught by other teachers. There has been all too frequently a tendency for teachers to regard the operation as now complete and to stop here. By so doing they deprive themselves of the greatest value which standardized tests may yield. There are two other vitally important steps which must be taken before the real fundamental purpose underlying all scientific testing is gained.

Interpretation of the Scores.—The third step is the interpretation of the scores. This consists in analyzing the lump results into their specific factors, determining the various types of errors and the frequency with which each type occurs. This will enable the teacher to group together pupils who have similar weaknesses and to give to each group the particular type of instruction needed. There will usually be found a number of pupils who

display a satisfactory grasp of some portions of the subject, so that to drill these further on that matter will be for them largely a waste of time and energy, though other members of the class may need further drill therein. The teacher is now in a position to focus her attention on the type of weaknesses peculiar to each group. This will save much lost motion and eliminate the class drills no longer needed, the further use of which usually proves so irksome to the pupils and wearing upon the teacher because barren of results.

The process of interpretation will generally be greatly facilitated by plotting on a graph the distribution of the scores, showing both the variability and the groupings into which the members of the class fall. The graph renders perceptible at a glance, disentangled from the confusing minutiæ of numerous individual scores, the salient features of the class performance. The central tendency of the whole class and the number of pupils who are above or below the class average is more readily grasped from the chart than from a long column of figures. By presenting the results in this vivid graphic form, not only the teacher but the pupil as well grasps the significance of his individual performance and that of his class. His interest and coöperation are now more readily enlisted to

secure an improvement which next time will trace on the graph a better story.

Planning Remedial Instruction.—The fourth step consists in the planning of remedial instruction and its application where it is needed. In the absence of definite knowledge as to the specific needs of the various members or groups of members in a class, the teacher is obliged to guess at what she thinks is the treatment needed. When definite knowledge is supplied, the type of instruction which she has conjectured was needed will frequently have to be modified to meet the needs disclosed. The results of the test replace the previous conjectural basis with a factual basis upon which the teacher can construct the types of treatment actually needed.

This last step represents the culmination, the flowering of the other three. To stop short of this step is to perform all the labor to locate the trouble and then to make no use of the facts discovered, by failing to apply a remedy. As W. S. Monroe has aptly pointed out, it would be similar to the case of the physician who made a careful diagnosis of the ailment from which the patient was suffering, but stopped there without prescribing any remedy. The patient would be no better off than before. Similarly, a class is likely to continue with the same

weaknesses, making the same mistakes as before, unless the application of corrective treatment is the final outcome of the testing.

This chapter will treat in particular of the diagnostic value of standardized tests in reading. The four steps outlined above apply, however, not only to tests in reading but to tests in practically all the subjects in the curriculum. Moreover, the technique of planning remedial treatment in reading, on the basis of the results of the tests, will illustrate and will apply, *mutatis mutandis*, to the methods of devising corrective instruction based on the use of tests in the other subjects.

Standardized Reading Tests

Of the two forms of reading ability, oral and silent, it is the latter which is the more difficult to measure and diagnose. The efficiency in oral reading is manifested in an external manner to the teacher and the pupil. The teacher does not stand in such urgent need of assistance here as she does in the case of silent reading. Gray's Oral Reading Test, which is by far the one most extensively used, will be found, however, to be of material assistance in measuring the efficiency, classifying the types of errors, and diagnosing the individual needs. Each

pupil is tested individually. The directions are clear and explicit, so that the teacher using the test for the first time is apt to experience little or no difficulty in its administration.

Most of the scientific reading tests have been devised to accomplish the more difficult feat of measuring and diagnosing silent reading ability. For it is here that such scientific aids are especially needed. Moreover, the form of reading which modern research has shown to be the most effective, and which reflection reveals to be most frequently used, is silent reading. The more progressive schools are now beginning to give considerable attention to the development of this important ability. Numerous scientific tests have been devised to measure it. The Silent Reading Tests of Courtis, Monroe, Starch, Thorndike, Gray, Brown, Burgess, Haggerty, and the Kansas Silent Reading Tests are the ones most widely used. All of these recognize that silent reading is a composite—the sum of the ability to read with understanding plus the ability to read with varying degrees of rapidity. All the tests seek to measure both comprehension and rate.

Accordingly, the results of these tests reveal to a teacher not simply the general fact as to whether or not her class possesses average reading ability, but they dip down beneath that general fact and dis-

close how the class stands in comprehension and in rate. Thus a class may be found to be good in comprehension but slow in rate, or weak in comprehension and fast in rate.

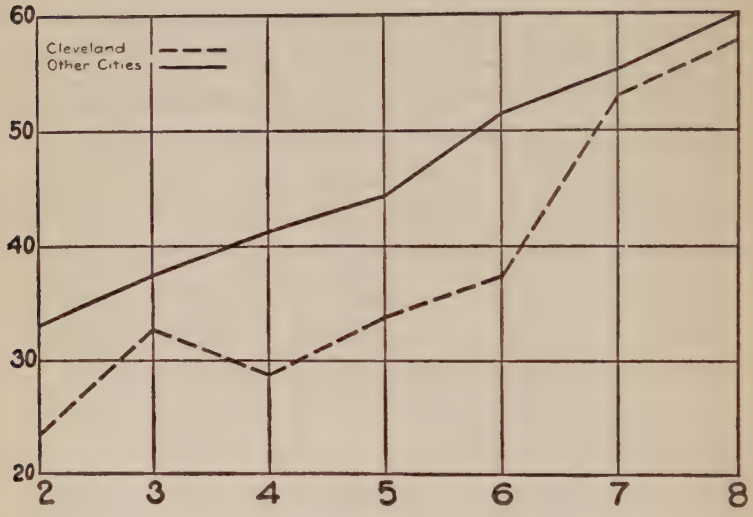

FIGURE IX

AVERAGE SCORES IN THE RATE OF SILENT READING OF 1,831 CLEVELAND PUPILS AND OF 2,654 PUPILS IN THIRTEEN OTHER CITIES. DATA ARE FOR GRADES FROM SECOND THROUGH EIGHTH. (FROM CLEVELAND SURVEY REPORT)

Use of Reading Tests in Cleveland Survey.—In the survey of the Cleveland schools it was found that the average rate in all the grades was superior to the standards prevailing in thirteen other cities,

while in comprehension the average in all the grades was inferior. These findings are shown in graphic form in Figures 9 and 10. Figure 11 shows that in oral reading the Cleveland schools surpassed the norms prevailing in twenty-three Illinois schools.

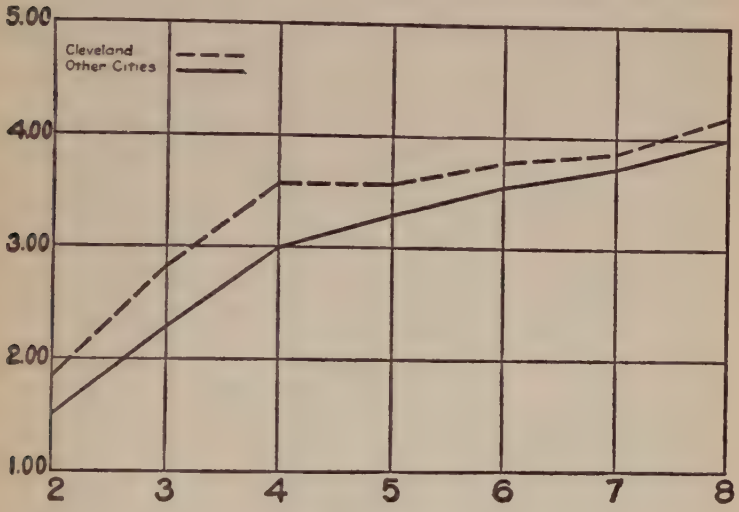

FIGURE X

AVERAGE SCORES IN THE QUALITY OF SILENT READING OF 1,831 CLEVELAND PUPILS AND OF 2,654 PUPILS IN THIRTEEN OTHER CITIES. DATA ARE FOR GRADES FROM SECOND THROUGH EIGHTH. (FROM CLEVELAND SURVEY REPORT)

On the basis of the results of these tests the survey staff was able to point out the need of a shift of emphasis to the interpretation or thought side in reading as a helpful form of remedial treatment.

"There is not sufficient attention," concludes the survey report, "to interpretation in the grades up to

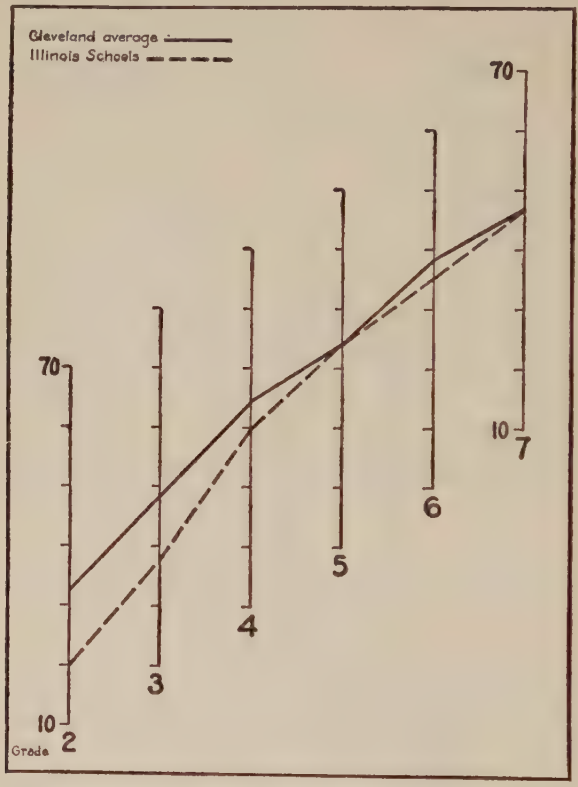

FIGURE XI

COMPARISON OF THE CLEVELAND SCHOOLS AND TWENTY-THREE ILLINOIS SCHOOLS IN ORAL READING

the fourth. There is, indeed, a high degree of success in perfecting the mechanical operations, but

the ultimate achievement of the schools is below what it should be in quality because the quality is not adequately stressed in the lower grades."

This is a good illustration of the use of test results to form the basis for the planning of remedial treatment to meet the specific weakness disclosed. If the survey had stopped short of this essential step, it is a question whether it would have justified the expenditure involved.

The type of diagnosis just mentioned reveals the central tendencies of the various grades in a school system. The tests disclose the points of relative weakness and of strength. Thus, in Cleveland, the teachers discovered that in oral reading their classes averaged higher than the norms in twenty-three Illinois schools, while in silent reading their classes were superior in rate but inferior in comprehension.

Diagnosis of Individual Needs.—There is another type of diagnosis in which the attention is focused upon the performances of the individual members of a class. In this case, the class, instead of the school system as a whole, is the large unit in the investigation. The variation within the class, the types of errors made, the groupings into which the pupils fall, are here the focal points.

Thus after administering a standardized silent reading test, the teacher is apt to discover that the

pupils fall into groups of those who are: (1) slow in rate but good in comprehension; (2) slow in rate but poor in comprehension; (3) medium in rate and

Index of Comprehension.

Diagnosis		Guesswork			Comprehension poor; additional training needed					Comprehension satisfactory		
Questions Answered	Total	Less than −5	−5 to +5	6–39	40–69	70–79	80–84	85–89	90–94	95–99	100	
70												
65												
60												
55												
50												
45												
40												
35												
30												
25												
20												
15												
10												
5												
0												
Total												

Rate of work satisfactory

Diagnosis: Rate of Reading too slow. Additional training needed.

Median Number of Last Question Answered_____ Median Index of Comprehension_____

Total Number Taking Test_____ Number Marked I. N. F._____

FIGURE XII

DIAGNOSTIC CHART TO BE USED WITH COURTIS READING TEST

medium in comprehension; (4) fast in rate but poor in comprehension; (5) fast in rate and good in comprehension, besides many of the intermediate

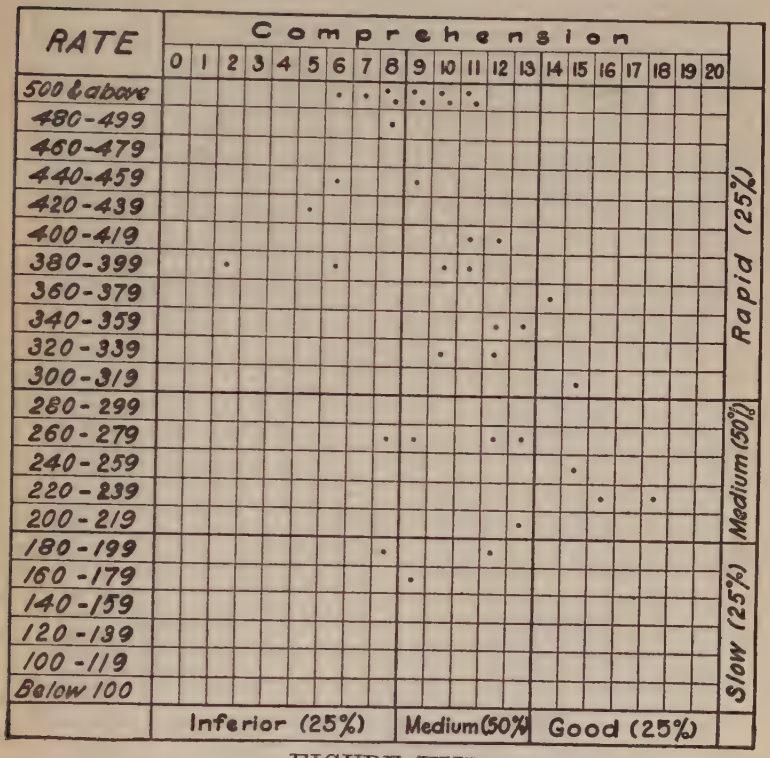

FIGURE XIII

DIAGNOSTIC READING CHART SHOWING DISTRIBUTION OF THIRTY-SEVEN PUPILS IN EIGHTH-GRADE CLASS IN A ST. LOUIS SCHOOL (FROM STONE)

combinations of the two elements of rate and comprehension.

Diagnostic Reading Charts.—The diagnostic chart to be used in connection with the Courtis Silent Reading Test is shown in Figure 12. When the teacher plots the distribution of the pupils' scores on the chart, the diagnosis of the weaknesses and the grouping of pupils needing similar treatment is automatically disclosed. With the use of such a chart it becomes a rather simple matter for the teacher to interpret the scores of the class and to perceive the various types of treatment needed.

Similar in principle to the Courtis chart, but differing in some particulars, is the chart designed by C. R. Stone and shown in Figure 13. The chart is so constructed that on the basis of 420 eighth-grade pupils tested, fifty percent are calculated to fall in the medium comprehension division, twenty-five percent in the inferior, and twenty-five percent in the superior comprehension division. The same proportions apply to the rate divisions. This proportioning parallels the normal distribution curve. In Figure 13 is shown the actual distribution of the thirty-seven eighth-grade pupils on the basis of Stone's newly devised test. The chart shows that the class average in rate, 390 words per minute, is above the standard, 245; while in comprehension its average of 10.6 is slightly below the city average of 11.4.

Perhaps of even greater consequence than the disclosure of the central tendency of the class in both rate and comprehension is the graphic distribu-

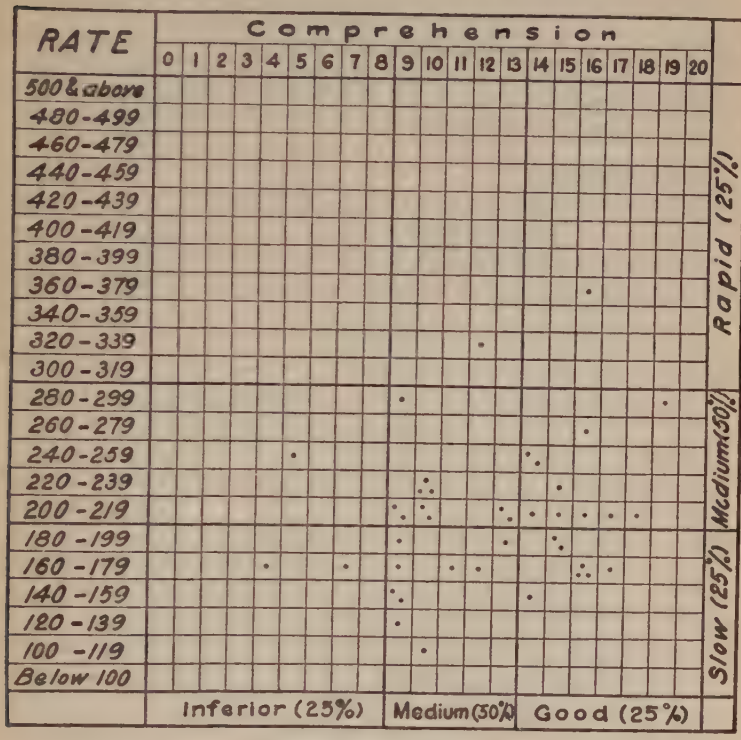

FIGURE XIV

Diagnostic Reading Chart Showing Distribution of Forty-two Pupils in Eighth-Grade Class in a St. Louis School (From Stone)

tion of the pupils into groups of comparative homogeneity. The teacher can see at a glance the

pupils who need training in speed, and those who, on the other hand, need training only in comprehension. Thus the nine pupils falling into the rapid inferior group need practice in slow, thoughtful reading with the emphasis on the meaning of the content. Their rate is entirely satisfactory, but they must be told to read no faster than they can understand.

When the same silent reading tests were applied to another eighth-grade class in a different school in St. Louis, the diagnosis revealed a radically different condition. The distribution of the pupils on the diagnostic chart is shown in Figure 14. Instead of being fast in rate and poor in comprehension, the central tendencies are just the opposite. In comprehension the class medium 13.0 is appreciably above the standard, while in rate the class medium 202 is considerably below. A glance at the two charts reveals instantly and vividly the striking difference in the character of the reading abilities of the two classes. Not less cogently do they indicate the need of radically different remedial training. In the previous chart, Figure 13, the pupil's scores as represented by the dots tending to congregate toward the upper left-hand corner, the division of rapid, inaccurate readers; while in this chart the tendency is to fall toward the lower right-hand corner, the

grouping of slow accurate readers. A comparison of the two charts discloses that in the first class tested there are nine pupils in the section of rapid, inaccurate readers and none in the slow accurate group; while in the latter class there is none in the rapid, inaccurate division and seven in the slow, accurate section.

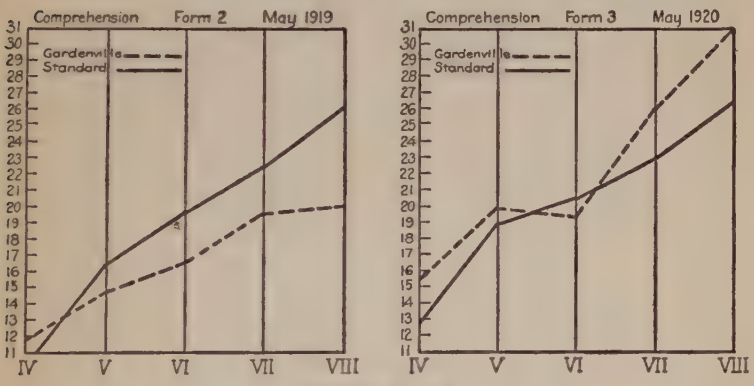

FIGURE XV

GRAPHS SHOWING COMPARISON OF SCORES IN RATE OF READING OF PUPILS IN GARDENVILLE SCHOOL, ST. LOUIS, WITH SCORES ACHIEVED AFTER ONE YEAR OF REMEDIAL TREATMENT (FROM STONE)

It seems apparent that in the latter class the teacher has emphasized thoroughness at the expense of rate. Without sacrificing in any way the quality of the comprehension the teacher should give them exercises which would gradually speed up their rate to at least the prevailing standards. There is over-

whelming experimental evidence to show that this can be done without impairing the comprehension.

Beneficial Results of Corrective Treatment.—An interesting illustration of the beneficial results of properly planned remedial instructions based on

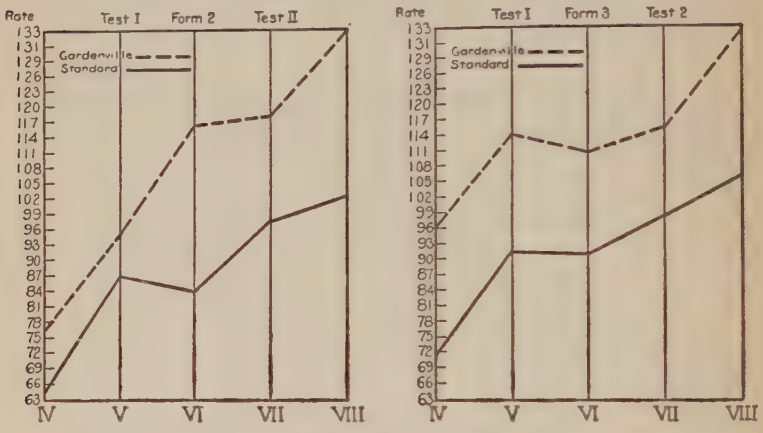

FIGURE XVI

GRAPHS SHOWING COMPARISON OF SCORES IN COMPREHENSION IN READING OF PUPILS IN GARDENVILLE SCHOOL, ST. LOUIS, WITH SCORES ACHIEVED AFTER ONE YEAR OF REMEDIAL TREATMENT (FROM STONE)

the standardized test diagnosis is shown in Figures 15 and 16. The pupils in the Gardenville School in St. Louis in all the grades above the second were given Form II of the Monroe test in May, 1919. When the results were tabulated it was discovered that in rate all the grades were above standard,

while in comprehension all the grades except the fourth were below.

"The results shown by the test," says Principal Stone, "were made the basis of a teachers' meeting. In discussing the reasons why the classes as a general rule were above standard in rate and below in comprehension, it was concluded that this was due to carelessness, working too rapidly, failure to check up or to verify answers, and to a lack of training in the type of comprehension involved. It was made clear that the problem of the school, especially above the fourth grade, was to work for accurate comprehension in reading and study under the stimulus of a time limit. During the last school year, a number of meetings have been held for considering the reading problem. Two were given to the problem of getting the pupils to check up on their reading, by verifying through re-reading as much as was necessary. Exercises for developing facility in quick, ready grasp of a fact or relationship expressed, and for developing the habit of checking up quickly and accurately, were formulated and used in the rooms."

In May, 1920, after a year of corrective treatment, Monroe's test with a form containing different content matter was again administered to the pupils.

The results of this second test, as presented in Figure 8, show distinctly the effects of the properly directed emphasis in the training. In rate all the grades are still above standard, with improvement in the lower grades being especially marked. The success of the training in meeting the specific weakness disclosed in the previous test—namely, the poor quality of the comprehension—is evidenced by the improvement in comprehension in every grade. Instead of being considerably below standard, as they were the year before, every grade except the sixth was now considerably superior to the standard. The exception of the sixth grade is attributed by Stone to the fact that these pupils were taught by inexperienced teachers, though even here an improvement over the preceding year was secured. The marked improvement in comprehension in every grade clearly demonstrates the wisdom and effectiveness of modifying the conventional instruction to apply corrective treatment where it is needed.

From this study Stone concludes:

"The individual teachers should make careful analyses of the showing of their classes on each particular test. Interpretation of the results should be to improve plans for classifying and instructing the pupils in accordance with individual abilities,

attainments, and needs. Teachers should learn to diagnose individual cases of weakness and provide suitable remedial treatment."

Individualizing the Instruction.—For the purpose of remedial treatment, pupils should be placed in the groups of the nearest homogeneity. The pupil will then receive instructions adapted to his individual needs. For, if there is any one thing which scientific investigations in educational psychology during the last two decades have demonstrated with convincing certainty and force, it is the existence of wide individual differences among the pupils in the same class. The two extremes in a class will differ not infrequently as much as three or more grades. The pedagogical corollary of this psychological finding is to effect a corresponding individualization of the instruction—instruction that recognizes facts as facts and adapts itself accordingly.

Conclusions.—The two charts, Figures 13 and 14, showing the wide difference in the character of the reading ability of two eighth-grade classes in the same school system, reveal strikingly the diagnostic value of standardized reading tests. With an objectivity and a total absence of personal caprice and bias that disarm criticism or resentment, the tests reveal to the pupil, as well as to the teacher,

his specific individual weaknesses, thus enabling him to overcome them. There can be no basis for the suspicion that the teacher underestimating his ability is giving to him unduly low marks. For the tests, standardized on the basis of the performances of many thousands, even hundreds of thousands of pupils, are administered to him in an impersonal manner under precisely the same conditions that they are given to all the other members of the class.

The diagnostic charts presented in this chapter demonstrate, more vividly and forcibly than words can express, the wide differences in the needs of members of the same class. They demonstrate conclusively the weakness of the practice of giving uniform training to all the members of the class, when there exists such marked variation in the specific needs of the different groups. It is somewhat similar to the case of the physician who would give to his patients suffering from such different ailments as rheumatism, lumbago, bronchitis, neuralgia and sore eyes, the same prescription, the same uniform type of treatment. It is an eloquent and a convincing story which the diagnostic chart tells, and not the least of its virtues is that it narrates the story in so graphic and vivid a language that even he who runs, can read and understand.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. What is the chief purpose of standardized tests? Why should they be more than mere "measuring rods"? What are some of their secondary values?

2. What is the first step in testing? What cautions should be used?

3. What is the second step in testing? What is the usefulness of the statistical method applied to the compilation of class scores?

4. What is the function of graphing in the completion of the third step?

5. Why is the fourth step in a sense the most important? Describe it.

6. What are some of the more commonly used silent reading tests? How do they differ from one another? Discuss the advantages and disadvantages of each.

7. What use did reading tests serve in the Cleveland Survey?

8. How may silent reading tests yield a diagnosis of the reading needs of individual members of a class?

9. What is the function of diagnostic reading charts?

10. What are the beneficial results of corrective treatment?

11. What are the advantages of individualizing the instruction as compared with the giving of a uniform type of instruction to all the members of the class?

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CHAPTER IX

READING DIFFICULTIES: THEIR DIAGNOSIS AND REMEDIAL TREATMENT BY CLINICAL METHOD

Besides the use of standardized tests to diagnose reading difficulties, another method has recently come into vogue in the school systems of our larger cities, which represents the most scientific, the most complete, and the most highly organized mode of attack which has yet been devised by educational specialists. W. S. Gray, of the University of Chicago, describes the application of this method to individual cases and points out the remedial treatment devised by himself and his co-laborers for the chief types of defects discovered in the reading of pupils. This technique is now being employed in the school systems of many of our larger cities, where educational clinics have been established and special teachers have been provided, to apply the remedial treatment which the diagnosis revealed to be needed. In the list of more than thirty cities carrying on such work, the diagnostic and remedial treatment provided in Toledo, Los Angeles, Seattle, and Rochester, N. Y., has attracted special attention. While

not every teacher will be in a position to use all the details of the method in diagnosing reading difficulties, they are all suggestive and many of them can be adapted to suit the exigencies of the particular class-room situation.

The Technique of Diagnosis

This method of the educational diagnostician is similar to the procedure employed in the clinical study of maladies, supplemented by the case history as secured by the social worker. The method involves three major steps, which are thus outlined by Gray:[1]

1. A study of the child's history was made at the beginning to secure facts which might aid in determining the specific difficulties which he encountered. Later, his history was reviewed to find a possible explanation for poor work and for any unusual difficulties. Facts concerning his history were secured from school records, teachers, and parents. In some cases it was impossible to secure sufficient reliable information to make effective use of it in the diagnosis.

2. A preliminary diagnosis was made of the child's reading accomplishments through the use of standardized tests. A careful analysis was made of the results of these tests in order to determine in which phases of reading he encountered serious difficulties. A general intelligence test was also given to determine his probable learning capacity.

[1] W. S. Gray, *Remedial Cases in Reading: Their Diagnosis and Treatment*. Supplementary Educational Monographs, No. 22, June, 1922, University of Chicago Press.

3. A more deliberate analysis of his reading difficulties was usually made through the use of informal or unstandardized tests. This step was necessary because the standardized tests frequently failed to provide sufficient information to insure an accurate diagnosis. In some cases these informal tests were modifications of standardized tests; in other cases they were based on selections in readers. Before the specific nature of a child's difficulties was accurately determined it frequently became necessary to observe his classroom work, to secure information from his teachers concerning his reading errors and difficulties, to compare with him a good reader for the purpose of determining differences, and to make use of the child's own introspections and comments.

History of Cases.—An important item in this method of securing an insight into the cause of the pupil's difficulty was the compilation of the pupil's past history. In order to systemize this part of the method, a blank comprising more than a hundred items was prepared through the coöperation of L. W. Miller and more than a hundred supervisors and teachers of reading. The blank contained such headings, as: Home Conditions; Physical History and Conditions; Mental Characteristics, Temperament, and Play Activities; School History; Reading History; and Present Status in Reading. The items under the three latter headings are particularly important, and contain valuable suggestions for the procedure of all teachers in diagnosing reading difficulties. These items are the following, as outlined by Gray:

School History (Other than Reading)

1. Pedagogical index:
   (a) Grade now in?
   (b) Years in school?
2. Grade or grades "skipped"? Why?
3. Did pupil ever fail to be promoted? Why?

Grade	School Attended	Kind—City, Country, Public, Parochial, Private	Age At Entering	Number of Years Grade	Descriptive Statements Concerning Quality of Work
Kindergarten					
First					
Second					
Third					
Fourth					
Fifth					
Sixth					
Seventh					

4. Average grade or mark given thus far this year in each subject taken by the pupil.

Subjects	Grade	Other Subjects	Grade
Reading			
Spelling			
Language			
Writing			
History			
Geography			

5. Is slow progress in any subject due to difficulties in reading? (Comment in detail)
6. Has attendance been regular? Causes of irregularity and amount?
7. Attitude of
   (a) Pupil to teacher?
   (b) Pupil to school?
8. Does child use library? How much?
9. Additional facts concerning school work other than reading which might explain cause of slow progress in reading?

Reading History

1. Before the child entered school, were the conditions in the home such as to stimulate an interest in books and a desire to read?
   (a) Was instruction attempted?
      (1) Amount and character?
      (2) Success?
2. Was instruction in reading given in the kindergarten?
   (a) Amount?
   (b) Character?
3. Type of instruction in primary grades?
   (a) Basis method used, if any?
   (b) Was reading for content stressed?
      (1) Did he acquire habits of intelligent reading?
   (c) Was instruction given in phonetics and word analysis?
      (1) Did he become an independent fluent reader?
   (d) Extent of opportunities for supplementary or library reading?
      (1) Amount of voluntary reading?
      (2) Kinds of selections chosen?
4. Character of instruction in grades IV, V, and VI?
5. Has reading development been fluctuating or uniform?
   (a) When was difficulty first noticed?
      (1) Nature of difficulty?

6. Has he ever had remedial work?
   (a) When? Purpose?
   (b) How long continued?
   (c) Methods employed?
   (d) Results?
7. Additional facts in reading history which might explain present difficulties in reading?

Present Status in Reading

1. Oral (answer the following questions in detail):
   (a) In what phases does he excel?
   (b) What are his characteristic weaknesses?
2. Silent (answer the following questions in detail):
   (a) In what phases does he excel?
   (b) What are his characteristic weaknesses?
3. What reading difficulties, if any, are evidenced in content subjects, such as history, geography, science?
4. What are the amount and character of the pupil's outside or supplementary reading?
5. Probable causes of reading difficulties:
   (a) Does he express himself in English as well as the average pupils in his grade? If not, in what way is he deficient?
   (b) Is his vocabulary adequate?
      (1) In speaking?
      (2) In understanding what he hears.
   (c) Are his experiences adequate for the comprehension of what he reads?
   (d) Additional significant causes?
6. Special interests of pupil which may be used in overcoming reading difficulties:
   (a) In school subjects?
   (b) In outside activities?
7. Additional facts of significance?

Specific Causes of Reading Failures and Their Remedies

A diagnosis to be complete and effective must determine not only the difficulty locating the specific process in the reading complex which is defective, but it must also ascertain the underlying cause of the defect. There are general and specific causes of failure. McCall [2] lists insufficient practice, improper modes of work, deficiency in fundamental skills, absence of interest, physical defects, and subnormal intelligence as "common fundamental breeders of ability defects." Yet in order to construct proper remedial treatment and to apply it, the investigation must penetrate beyond the lump cause to the specific factor creating the difficulty. The knowledge, therefore, of the specific cause of the difficulty in the case of each individual reader is desirable and even necessary in order to remove it through the application of proper remedial training. A survey of the literature shows, according to W. S. Gray, the importance of the following specific causes of reading failures.

1. Inferior Learning Capacity.—Pupils who are

[2] W. A. McCall, *How to Measure in Education*, pp. 109–111, The Macmillan Co., 1922.

mentally defective may be divided into two classes. There is the one class which is unable to learn to read and which is usually given manual training to enable its members to earn a livelihood. The other class, while of low intelligence, is able to learn to read if appropriate methods are employed. They are apt to fail, however, if they are grouped with the pupils of normal mentality and are treated with the methods designed for the latter. Thus Keener [3] reports the necessity of appropriate classification and simple remedial training to secure satisfactory results.

"In one second grade the intelligence tests showed that the pupils ranged from moron to very superior inability. They were arranged into groups as homogeneous as possible, taking into account the results of the tests, the scholarship records, and the judgment of the teacher. The members of the slowest group learned much more rapidly when taken from the regular classes. One boy with an I. Q. of 52 had been in school for a number of years without being able to read at all. In a group where other children were not greatly superior to him, he learned to read easy material. Until this arrangement was made the teaching went entirely over his head.

[3] E. E. Keener, "Use of Measurements in a Small City School System," *Journal of Educational Research*, March, 1921.

On the other hand, the brightest group did much more than the normal amount of work for the second grade. Six of the brightest pupils were put into the next higher grade, and their present success indicates that they will continue to advance at more than the normal rate."

2. **Congenital Word Blindness.**—There are cases on record of children who are otherwise normally endowed, who experience extreme difficulty in recognizing or interpreting printed or written symbols. This defect, known as congenital word blindness, or dyslexia, refers to the inability to interpret words, not to the inability to see them. It is attributed to "imperfections or lack of development of those areas of the brain which normally serve as centers for reporting images or memories of printed or written symbols." It appears to be an hereditary trait, being found in several generations of the same family.

Dyslexia differs in character and in severity. Thus, "word blindness may affect only letters or Arabic numerals or certain groups of letters or figures, or certain syllables, or whole words, or certain groups of words, or certain languages, but not others." Loss of ability to read may also occur through disease or injury. This defect known as alexia is traceable to lesions in the left angular

gyrus, which is the area of the brain agreed upon as the center for recording images or memories of written or printed symbols. Wallin[4] offers the following practical suggestions for the treatment of cases of dyslexia by the school.

"Word-blind children who are not feeble-minded should be assigned to special reading disability classes, where various methods and devices of teaching reading may be tried out. We shall find that some children can be reached by certain methods, while others can be reached by other methods. When it has been shown, however, that a child cannot be taught to read by the intensive application of various methods of teaching reading, the school branches should be presented orally. In fact, one of the advantages of assigning a word-blind child to a reading disability class is that he may secure from the teacher's lips the instruction which fits his level of intelligence and which he cannot secure through the printed page because of his inability to read."

3. Poor Auditory Memory.—Some reading difficulties are directly traceable to "hardness of hearing." When pupils of lowered auditory acuity are

[4] J. E. W. Wallin, "Congenital Word Blindness—Some Analyses of Cases," *The Training School Bulletin*, Vineland, New Jersey, September-October, 1920, p. 3.

moved to the front seats, the difficulty usually disappears. A somewhat more subtle difficulty results from the possession of a poor auditory memory in a pupil of normal auditory acuity. The pupil fails to remember the sound of words and consequently confusion or complete failure in reading results. G. W. Willard of Seattle, Washington, thus describes the technique used to effect improvement in a pupil of poor auditory memory.

"A girl ten years of age, who entered school at six and attended regularly four different schools, had great difficulty in reading in the second reader. She was tested at the Child Study Laboratory and found to have normal mentality, but very poor auditory memory. The child would sound a letter and call it another letter. The teacher soon found that she had no conception whatever of phonics, and in fact could not pronounce a word after the teacher had sounded it. She also had difficulty in making the right sounds. She evidently had never learned to listen, and various methods were tried but of no avail until the method used with deaf children was tried. The child would put her finger tips on the teacher's throat to get the vibrations. By this method the child got an idea of sound and since she had unusual rhythm, that was utilized in the phonetic work. Her difficulties were gradually over-

come. She was returned to her grade and at present is having no difficulty."

4. **Defective Vision.**—Many failures in reading are due to defective vision which could be remedied by proper lenses. In almost every class there are found pupils who are suffering from some defect in vision, of which neither they themselves nor the teacher are aware. There is no doubt that many failures in reading and consequently in the other school subjects would be eliminated through careful examination of the eyesight of pupils. When difficulty in reading is reported this should be one of the first steps taken in the diagnostic treatment. The following case reported by Keener may be cited as typical.

"A third-grade boy was unable to make any score on the Gray Oral Reading Test. Since he was suspected of being feeble-minded, he was given the Binet test. This test showed him to be normal mentally; and accordingly further effort was made to find the cause of his poor reading. His eyes were tested with the letter chart and seemed normal. When questioned, however, he reported that the letters looked as if "someone had put a wet blotter on the book" and blurred them. His eyes were treated and fitted with glasses; and at the close of

one year he scored 39 on the Gray Oral Reading Test."

5. **Narrow Span of Recognition.**—A narrow visual span whereby only a very small portion of a printed line is recognized in a single fixation, frequently results in slow rates, and in stumbling, halting, oral reading. The visual span used in reading is usually much narrower than the span which pupils are capable of employing, as revealed in tachistoscopic exposure exercises. The latter show that pupils are capable of perceiving phrases and sentences of five and six words in a single fixation. This is more than double the size of the average visual span used in reading. An investigation conducted by the writer shows that the visual span utilized in reading by pupils in all the elementary grades may be enlarged by appropriate exercises. Short exposure exercises, such as the use of flash cards, and the conscious effort to read rapidly, and to "see more at a glance," generally cause the pupil to perceive a larger portion of the printed line in a single fixation.

6. **Ineffective Eye-movements.**—The failure to establish habits of moving the eyes from left to right along the printed line and of sweeping rapidly back from the end of one line to the beginning of

the next, results in poor reading. Gray cites the case of a fourth-grade pupil whose first fixation would frequently occur in the middle, and sometimes at the end of the line. The subsequent fixations were irregular and lacking in evidence of a definite plan of attack. These failures may be traceable to poor coördination of the eye, to word difficulties, to guessing, and to faulty instruction. The remedial treatment devised is thus described by Gray:

"Drill exercises which differed from ordinary printed material in two respects were prepared for use in establishing effective eye-movements. The lines were typewritten an inch apart to aid in developing accurate return sweeps from the end of one line to the beginning of the next. In order to develop regular movements of the eyes from left to right along the lines, three sets of exercises were prepared in which the spacings between words were wider than in ordinary print. In the first exercises, unrelated words were typewritten five letter-spaces apart. The boy was required to read these words in regular order for five minutes each day. After considerable progress had been made in the fluent recognition of unrelated words, a simple story was typewritten with five letter-spaces between words. After completing the exercises of this type the words were grouped in thought units which were

separated by five periods. The fluency and accuracy with which he soon read indicated that the graded exercises and the constructive suggestions which accompanied them had eliminated at least two of his major difficulties. Other problems, such as increasing the span of recognition and the development of independence in the recognition of words, were then undertaken. At the end of four months the boy was permitted to resume regular work with his class. One year later he was carrying fifth-grade work very successfully."

7. **Inadequate Training in Phonetics.**—Judd cites instances of pupils whose reading breaks down when they encounter new words which they are unable to analyze into their constituent phonetic elements. While there are many words which pupils master without any systematic training in phonetics, there is always the danger of meeting new combinations of letters which may baffle the efforts at independent pronunciation if the pupil is unequipped with a definite method of attacking such new word forms and of analyzing them into their phonetic elements. G. W. Willard, Seattle, Washington, reports the following case illustrating the help received by a second-grade pupil through individual instruction in phonetics.

"A girl 8 years of age in the second grade was

unable to read. She was tested at the Child Study Laboratory and found to be normal mentally, and she was also normal physically. She entered the Restoration Class. Study showed that she had no phonetic foundation and was unable to memorize all the new words introduced and consequently was very much confused. An attractive phonetic chart of the various families was made. Little stories were introduced to arouse the child's interest. A game was organized in which the teacher sounded the words and the child pronounced them. This was played for two weeks until the child expressed a wish to change the game and sound the words and have the teacher pronounce them. It was discovered that the child had a real fear whenever she was asked to sound words. Confidence being established, she was taught to read and was returned to her grade in two months. The report shows that at present she is having no difficulty."

8. Inadequate Attention to the Content.—Training in phonetics may be, and at times has been, overdone. When too great stress is placed on the mechanics of reading and is directed almost entirely upon the word forms and sounds, the meaning side is neglected. This neglect of the content side manifests itself in dull, monotonous oral reading, which

might more appropriately be termed "word calling," and in defective interpretation in silent reading. Freeman reports the following case illustrating the need of shifting the emphasis from word phonetics to recognition of the meaning.

"The conclusion was arrived at that for this child, at least, phonetic drill had been carried beyond the point where it was useful. Instead of being the means to the recognition of word meaning it had become an end in itself, and really blocked the recognition of the meaning. The treatment, therefore, had as its first object the short-circuiting of this roundabout association and the attempt to develop a more direct association between the sight of the words and their meaning. For the time being, then, all phonetic analysis was abandoned, but later on some attention was given to the syllabication of words in order to develop the recognition of the typical sounds represented by the different letter combinations. But this analysis was always made with real words, and the habit of recording letters as mere sounds was broken up."

9. Inadequate Speaking Vocabulary.—Meagre speaking vocabularies, such as are found in foreign-born children and those reared in homes where a foreign-language is used, cause many reading diffi-

culties. Gray thus summarizes a case reported by Anderson and Merton illustrating such a difficulty and the remedial treatment applied.

"This boy was in the third grade when the study of his case began. Polish was the only language spoken in the home and mail-order catalogues were the only reading materials found there. He did not enter school until he was approximately nine years old. On account of his size and age he was placed in the second grade and transferred the following year to the third. When given the Gray Oral-Reading Test he made fourteen substitutions in three paragraphs. They entirely destroyed the meaning of the paragraphs and showed clearly that reading was for this boy merely a process of word calling. Remedial training was given first in oral reading and word analysis. These were soon discontinued for a time in favor of conversation lessons about things in which he was interested. 'Topics relating to the making of a kite, fishing, etc., were discussed. At the close of a period the discussion was summed up in a few sentences which the teacher wrote upon the board as the boy gave them. This was then made the story for oral reading in that lesson.' Numerous types of language and informal reading exercises were given before readers were used again. When lessons were finally assigned

from them, stories were chosen of boys' experiences and of animals from the Elson First Reader and the Beacon Second Reader. 'Each lesson showed a slow but gradual growth in reading power.' ''

10. **Small Meaning Vocabulary.**—Somewhat similar to the cause mentioned above is the vocabulary meagre in meaning content. Words which pupils encounter in reading and which they are able to pronounce but which they have seldom or never heard in conversation, are apt to have little meaning content for them. The result shows itself in poor interpretation of such passages. There are many American homes where children hear in conversation only a very limited number of words. Judd [5] reports the case of a seventh-grade pupil whose poor comprehension was due to a small meaning vocabulary.

''This seventh-grade boy was fourteen years and ten months old when his training began. 'His teachers report him as a shy, timid boy, easily embarrassed, lacking in self-confidence and initiative in the classroom, though very energetic and responsive on the athletic field. . . . He reads in a dull, monotonous tone, slurring words and phrases. When

[5] C. H. Judd, *Reading: Its Nature and Development.* Supplementary Educational Monographs, II. No. 4, July, 1918. pp. 106–118.

asked to tell what he has read, he reproduces a few ideas in short, scrappy sentences, for apparently he makes few associations as he reads. His teachers in history and geography explain his poor standing in their subjects as attributable to inability to get ideas from the text. He apparently reads as rapidly silently as any in the class but gets and retains less of the thought.' A careful diagnosis of the case led to the conclusion that he had acquired ability to pronounce words which exceeded very much his ability to understand their meanings. Remedial training was carried on for eighteen weeks for the purpose of building up a background of meanings and of improving his ability to understand what he read. Oral and silent-reading lessons were assigned; words were studied in the context for meaning; and detailed studies were made of prefixes, suffixes and stems. At the conclusion of the training period tests were given again in both oral and silent reading. The remedial instruction had apparently affected the mechanical side of his reading very little. On the other hand, there was marked improvement in his comprehension of what he read.''

11. Speech Defects.—Habits of stuttering, talking through the teeth, distorting the mouth when speaking, and, in general, all speech defects are apt to interfere with oral reading. Many of these de-

fects may be overcome by appropriate remedial treatment. The following case of a third-grade boy who stuttered is cited by Gray from the report of Miss Margaret Yazer, Virginia, Minnesota.

"John is a nervous and self-conscious child. He has always stuttered, but this handicap has been more serious since an attack of diphtheria. Very remarkable results were obtained by reading aloud with him, allowing him to skip or stop whenever he wished to. He recovered quickly as a rule and continued to read. As these exercises continued he encountered difficulty less and less frequently. After several months, his teacher submitted the following report:

"His improvement as to stuttering continues to be very marked. At present he even volunteers to recite all by himself, a thing unheard of before. He does not always succeed, and it seems to me that two factors enter in when he fails: (1) Excitement, embarrassment, or nervousness may bring back the old stuttering habit. (2) There is a decided difference in his success based on the particular word that he chooses with which to begin his opening sentence. All words beginning with *b, p, l, a,* and *o* were practically impossible for him at first. They produced a dead halt and paroxysms of the throat, often followed by complete rout and

confusion. Today, due to a little game constantly played by himself and the teacher in a jolly way, he recognized these letters as definite obstacles to overcome. He has completely mastered *p* and *l* and is never entirely defeated by the others.' "

12. **Lack of Interest.**—Lack of interest and dislike for reading have been reported by teachers as the causes of failures. In many cases this lack of interest is traceable to some fundamental difficulty such as poor auditory memory, dyslexia, or visual defects, or to a combination of causes. The following typical case is reported by Miss Gracia Moss.

"The subject of this study was ten years old when the investigation began. Her school history revealed the fact that she had always been considered a poor reader. The first time we had a silent-reading period she looked bored and disgusted. On inquiry it was found that she had never been taught to read silently and that she had been required to give her attention mainly to the correct pronunciation of words and had never had her attention directed to the meaning. When she was asked to read for herself, she replied, 'I hate reading and I'll always be a poor reader.' The most important problem in remedial instruction was to stimulate a real interest in reading. A simple story of adventure was chosen first and read with her. She showed

some signs of interest. A number of stories were begun in class and she finished them herself. In a short time she had a book on her desk all the time, and when her other work was finished she read silently. She found in time that she could derive pleasure from reading and that she could read selections silently which she could not read aloud successfully. By the end of the third month she had read twenty-five books in the school library and was securing books regularly from the city library. At the end of the first semester she was not only an effective silent reader but had also become a very good oral reader."

13. Guessing Versus Accurate Recognition.—Pupils who have never been trained to attack words independently are apt when they encounter new words, to resort to guessing, or else to memorizing the passages read by other pupils to make apparently satisfactory recitations. Such habits are detrimental to development of reading ability and should be overcome as soon as detected. Proper motivation will generally be found of great assistance in inducing the pupil to overcome such habits in favor of more effective ones. G. W. Willard reports the following case, illustrating this type of difficulty and the means used to overcome it.

"A boy entered school at six years of age in 1919

and remained in the first grade until February, 1921. He was tested by the Child Study Laboratory and found to have normal intelligence. He was sent to the Restoration Class. It was found upon investigation that he had a reading vocabulary of twenty words. He had a very bad habit of guessing. It was discovered that he was very much interested in animal stories. With this as a cue, animal stories were read to him. He made an animal book by cutting out and pasting pictures of animals. Then he told simple stories about animals. These the teacher printed in his book. After two weeks, the boy wished to print his own stories. The teacher printed the stories on the board and the boy with a small printing press printed the stories in his book. This book he was so proud of that he wished to take it home so he could read the stories to his mother. The motive was sufficiently strong to help him break up the habit of guessing. In six months he was reading and in the second reader. He was returned to his grade and is having no difficulty."

14. Timidity.—Bashfulness, lack of confidence, timidity, are responsible for many failures in reading. The proper effort is not put forth because the pupil fears in advance that he will not succeed. The following case, reported by G. W. Willard, illus-

trates the difficulty and explains a helpful type of remedial treatment.

"A boy eight years of age of normal intelligence had attended school two years regularly and was still in the 1B class. Teacher's report: 'Very poor word memory. No phonetic sense. Stubborn. Does not enter into any of the school activities. Will take no part in conversation.' He entered the Restoration Class. The teacher found the boy to be extremely timid. For two weeks he answered in monosyllables. Various pictures and stories were used to find his line of interest. His interest was discovered when the picture of a Red Cross dog was shown to him. Using this as a cue, all sorts of pictures and stories of other dogs were used. At last a book was given to him and he was asked to read the story. In place of reading he told the story from memory. Confidence was established and the rest was easy. It was discovered that the boy had a good sense of sound and by individual work a phonetic basis was laid. The rapidity with which he progressed led us to believe that it was extreme timidity that was at the root of the trouble. He was returned to the second grade and the follow-up-report shows that he has had a double promotion and is a fluent reader."

The list of fourteen causes of failures in reading enumerated by Gray does not aim to be exhaustive,

but it is undoubtedly suggestive of the more important and prolific ones. To these might be added reading material unsuitable for the particular grade in which it is used, and defective teaching. The large number of causes enumerated indicates the need of a searching diagnosis to locate the root of the difficulty, and to ensure the devising and application of appropriate remedial treatment.

Remedial Instruction

When the cause of the reading difficulty has been determined, suitable remedial treatment should be immediately applied. The type of remedial instruction will vary with the type of reading difficulties disclosed. In his investigation into the causes of reading difficulties and the application of appropriate remedies, W. S. Gray states that there were several methods and devices which were used with but slight modifications in many cases. These methods reflect the more common types of reading difficulties, discovered in the investigation.

Exercises to Increase Accuracy of Recognition.—The first type of remedial instruction that was generally employed is thus described by Gray:

"Exercises were used to overcome three types of inaccuracies in word recognition.

1. Words which a pupil failed to recognize accurately while reading were used in sentences at the end of each period in order that he might associate them with their meaning. The words which repeatedly caused difficulty were then typewritten on cards and used in quick-perception drills, by presenting them as rapidly as they were recognized. Such words as *again, want, been, does,* and *heard* were frequently emphasized. As soon as a pupil was able to recognize a word readily, drill on it was discontinued. New words were added to the list as difficulties were encountered.

2. Words which a pupil confused because of their similarity in form were emphasized in drill exercises. These words included such groups as *thought, though,* and *through, there* and *where, then* and *when, now* and *how,* and *has, had,* and *have.* The words were used in sentences before they were presented in quick-perception drills. If unusual difficulties were encountered, words which were similar in form were presented together so that their differences could be studied.

3. Pupils who recognized isolated words accurately frequently made errors in recognizing the same words in phrases and sentences. In order to overcome this difficulty a word, such as *there,* was written on the board in several phrases or short

sentences and the pupil was given opportunity to study them deliberately. As soon as he was able to recognize these phrases readily they were typewritten on cards and presented in quick-perception drills."

Exercises to Increase Span of Recognition.—The second type of remedial treatment that was used extensively in Gray's investigation was the following:

"To aid a pupil in increasing his span of recognition, phrases were printed on cards and presented to him rapidly in flash-card, or quick-perception drills. At first, short phrases, such as *one day, every time, asked she, he said, very fast, over there,* and *as though,* were presented. These phrases were taken from the lessons which he was reading and the list included those which occurred most frequently. As soon as the pupil was able to recognize short phrases, longer and more difficult phrases were used, such as *again and again, over the hill, around the house, wherever he could, pretty little things, thought to himself, as fast as they could, while I am gone,* and *as much as he wanted.*"

Exercises to Increase Ability in Word Recognition.—The third type of training devised to overcome faulty word recognition is thus outlined:

"When a pupil had difficulty in recognizing and pronouncing words because he failed to associate

sounds and their symbols, he was given some training in phonetics. If he was unable to pronounce a word, such as *fed,* he was given a familiar word, such as *bed,* and was asked to name others ending in *ed.* If he failed to recognize the familiar element *ed* other words, such as *red* and *led,* were supplied. If the initial consonant caused difficulty, other words beginning with *f* were pronounced for him and written on the board. . . . If he had difficulty with the vowel sound, he was given lists of words containing short *e,* such as *met, set, get,* and *hen, when, den.* After several different endings and initial consonants had been used with short *e,* a chart containing such words as *let, pen, tell, fled,* and *bless* was presented to test the pupil's ability to recognize short *e* in various combinations. After all short vowel sounds or all long vowel sounds had been given, similar charts were prepared and used as a final test of recognition. This method prevented a child from depending entirely on so-called 'families' in recognizing words. Initial consonant blends, vowel digraphs, and phonograms were taught in the same way.

"In the cases of many pupils certain rules of pronunciation were given in addition to the exercises which have just been described. The rules which proved most helpful follow.

1. When there is only one vowel in a word or syllable, that vowel is usually short, as in *can, met, hit, not,* and *cup.*

2. When a one-syllable word ends in *e,* the *e* is silent and the preceding vowel is long, as in *lame, hope,* and *write.*

3. When there are two vowels together in a word or syllable, the first one is usually long and the second one is silent, as in *beat, rain,* and *coat.*''

Exercises to Aid in Interpretation.—The fourth kind of remedial instruction commonly used, is illustrated in the following:

''When a pupil had difficulty in interpreting the important points of a story and in reproducing the story in correct sequence, he was assigned a short selection which was sometimes divided into thought units. The page was cut as illustrated and the paragraphs were mounted with wider spaces between them than in ordinary print in order to emphasize each thought unit.

Billy the Crow

Bill, the crow, was very fond of corn. He used to go to the farmer's field at day break. He would call all the other crows to come too.

''The farmer said, 'I cannot let you eat all my corn.' So he made a scare-crow and put it in the

field, but that did not frighten Billy at all. Then the farmer said, 'I will get my gun and shoot those crows!'

Bill did not get shot, but he was so frightened that he left the farmer's corn alone. He told all the other crows to keep away too.

"The pupil was asked to read one paragraph at a time and to tell what he had read. If he failed, he was asked such questions as 'Who was Billy?' 'What did he like?' 'Where did he get it?' 'Who went with him?' If he could not answer the questions he was asked to re-read the passage. As soon as he was able to answer questions concerning the content of short passages accurately, the length and difficulty of the passages were increased."

Conclusions Concerning Remedial Instruction.—In Gray's investigation the effort was made to locate the cause of the reading difficulty and individual remedial treatment was then applied. The investigation disclosed a wide variety of causes and necessitated different types of remedial treatment. As a result of his study, Gray draws the following conclusions concerning remedial instruction for pupils who made little or no progress in learning to read.

"(1) Instruction must begin, as a rule, with the

simplest rudiments of reading. (2) It should be given preferably in the form of individual instruction. (3) The teacher must secure the complete confidence and coöperation of the pupil. (4) Selections must be chosen which will stimulate the interest, excite the curiosity, and hold the attention of the pupil. Consequently, the selections used must vary with the age of the subject. In all cases, however, they must be very simple. (5) The methods employed must result in vivid, lasting impressions. (6) The opportunity to associate symbols with their meaning and pronunciation must be repeated until desirable habits are established. (7) The teacher must expect slower progress than in the case of pupils who do not encounter unusual difficulties in learning to read. Furthermore, new habits and associations must be introduced slowly. Sufficient time must be allowed for the mastery of even very simple habits. (8) The most satisfactory results will be secured only through the practice which comes from reading a large amount of material with a genuine motive."

How Shall Class Instruction Deal with Individual Differences?

The various suggestions for specific remedial treatment made in this chapter imply the necessity

of individual instruction. But how can a teacher combine class instruction and treatment which is adapted to individual differences and needs? To this query Judd [6] gives the following answer:

"There are advantageous methods of attacking new words. Pupils at different levels of achievement can very properly be dealt with as a group for the purpose of imparting the universally useful methods of word analysis. It is the duty of the school to discover the common lessons of this type which should be given to the group. For example, phonic analysis in the primary grades and word and sentence analysis in the upper grades represent such steps in method.

"Beyond this common body of instruction in method appropriate to all the members of the class there is a demand for a great deal of individual training which has usually been neglected in the schools. Pupils who lag behind the class or who do not take on correct methods rapidly should be watched and given special help. Forward pupils should be encouraged by every possible device to work by themselves."

"The practical school program would undergo a change if these suggestions were adopted. Fifth-grade reading, for example, would no longer consist

[6] C. H. Judd, *op. cit.*, pp. 170 et seq.

of an oral exercise in which each pupil holds his book and waits for an opportunity to read a sentence in his turn. This class would devote three-fifths of its time each week to silent reading under supervision. This supervision would be so organized that the teacher would select the backward pupils and give them one type of instruction, consisting probably in phonic analysis. The forward group would be encouraged to read much. This rapid group would also be given instruction in spelling.

"The teacher who thus has several different kinds of reading exercises under way will be led to make an analysis of each pupil and will soon cultivate a true understanding of the meaning both of class organization and of individual variation from the average."

Analysis in School Work.—Concerning the necessity of analytical work to discover individual differences, Judd states:

"There are vast individual differences in pupils. There is also the practical necessity of dealing with pupils in groups. The problem is how to recognize individual needs and at the same time economize effort by working with groups. The solution of this problem will be found only when analysis of the

process which is being taught reveals those aspects which are common to all the members of the class and those which must be dealt with individually. When analysis has brought out these distinctions it is the duty of the school to so organize its instruction as to provide for both class instruction and individual instruction. There can be little doubt that teaching in groups has been overdone. Individual instruction based on analysis of individual performances is called for as one of the most important innovations to be worked out in the schools. Individual instruction, when it is properly worked out, will not be a chance concession to personal caprice but a systematic analysis of individual performances followed by an adaptation of instruction to individual levels of achievement."

Summary Concerning Individual Differences.—Judd summarizes his chapter on individual differences in reading in the following statements:

"There are great individual differences in methods of reading and in success in getting meanings from passages.

"These differences have various origins, some of them obscure and impossible of determination in the case of an advanced pupil.

"The duty of the teacher is to diagnose the indi-

vidual case as though it were a matter of method of work, ignoring the remoter causes which are part of the individual's inherited temperament.

"When the pupil's method of work is understood through analysis an attempt should be made to bring that method into a more efficient form. The more efficient form will in turn be known through analysis of successful readers.

"Analysis does not require the minute scientific testing of every case. Such scientific testing is desirable wherever possible. But the most direct applications of laboratory investigations of reading are to be found in the suggestions which they yield as to the probable character of miscellaneous cases which cannot readily be subjected to scientific study.

"Such analysis of cases as has been suggested will undoubtedly lead to changes in school practices. The results of such changes in school practices will serve as true scientific checks on the theories developed in the effort to apply laboratory results.

"Changes in school practice will follow different lines in view of differing needs. Especially will different grades emphasize different modes of instruction, as shown also in the last chapter. The lower grades will of necessity give more attention to the mechanics of reading. The upper grades will

attend more to the cultivation of powers of interpretation."

The suggestions outlined in this chapter concerning the diagnostic and remedial treatment of reading difficulties illustrate the methods of analysis and the types of remedies which every skillful teacher can devise and adapt to suit the needs of her pupils. The evidence presented by Gray indicates the necessity of persevering in the application of the proper remedial treatment to the individual pupil until the reading difficulty has been overcome. The study serves, moreover, to stimulate the devising of differentiated types of treatment adapted to the individual needs of the pupil, and thus takes the teaching of reading from the hit-or-miss basis of crude empiricism and places the procedure upon a sound scientific basis. The teaching of reading is thus rendered more effective for the pupil as well as more interesting and more pleasant for the teacher.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. Describe the clinical method of diagnosis. What are the advantages over diagnosis by standardized tests?

2. How does a knowledge of a pupil's past history in reading, in school work, in general intelligence, in home surroundings, enable a teacher to secure a deeper insight into the cause of a pupil's difficulty in reading?

3. What are the specific causes of reading failures, as listed by W. S. Gray?

4. What are the specific remedies suggested for each cause of reading failure?

5. What are some of the more fundamental types of remedial treatment?

6. Work out exercises to increase accuracy of recognition.

7. Develop a type of training to increase the span of recognition.

8. What exercises can you formulate to aid in interpretation in reading?

9. What pedagogical conclusions follow concerning remedial instruction?

10. How should class instruction deal with individual differences?

11. What changes should be made in the school program in the light of individual needs?

12. Why should the school work be subjected to a thoroughgoing analysis?

13. What summary could you draw concerning individual differences in reading? Compare it with Judd's summary.

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CHAPTER X

THE DEVELOPMENT OF SILENT READING ABILITY

The results of the great body of scientific research in the field of reading converge in emphasizing the importance of silent reading ability in modern life. After the primary grades the occasions requiring oral reading continue to decrease until in the upper grades they reach a minimum. Outside of school the average person seldom has occasion to read a newspaper, book, or magazine aloud. On the other hand, silent reading is employed in almost every phase of modern life, both in the business day and in the leisure hours. These practical considerations, combined with the psychological discovery of the superiority of silent over oral reading in both rate and comprehension, are causing a wise and much needed shift of emphasis in the schoolroom from oral to silent reading.

It is true that the ability to pronounce words correctly, to read feelingly, and with appropriate modulations of the voice in accordance with the laws of the elocutionist to orate effectively, are values of a permanent character. But these activities should

not be confused with reading, which consists essentially in the gathering of thought from the printed page. These other activities should be recognized as distinct and different, and should be taught in a separate period in the school program under some other and more accurate label than reading.

Development of Comprehension in Silent Reading

Now that the importance of silent reading ability is becoming universally recognized by educators, the question arises: How may silent reading ability be most effectively developed? There are two elements constituting silent reading ability: (1) comprehension and (2) rate. In the previous chapter specific methods and devices were suggested to develop the powers of interpretation. In general, it may be said that if the pupil is endowed with sufficient mentality to comprehend, the use of reading material of a simple character, well within the scope of the child's own experience, which is presented in such a manner as to arouse his interest, will gradually provoke his latent interpretative powers.

Pictures, object lessons, stories, games, class dramatization, are generally useful in stimulating the comprehension in reading. The appeal must

be through the concrete, the familiar, the interesting, and away from the abstract and that which is beyond the scope of the child's experience and interest.

Factors Influencing Rate of Silent Reading

After the pupil has been trained to interpret printed symbols, and the comprehension of the material read is satisfactory, the problem then arises, how may the other factor in silent reading ability, the rate, be improved? For the voluminous products of the modern press necessitate more than a slow plodding reading pace if any appreciable amount of it is to be reached. Moreover, the investigations of Quantz, Hendricks, Judd, and others have shown that, as a rule, rapid readers are superior also in comprehension to the slow readers. In rapid reading, there is usually greater concentration; there is less time for dawdling, day-dreaming, and for the infiltration of extraneous material into the mind.

In an investigation conducted by the author it was found that the following factors were of significance in accelerating the rate.

1. **Practice in Rapid Silent Reading.**—The influence of this factor in accelerating the reading rate has been demonstrated in the results reported by

Huey, Peters, C. T. Gray, Bowden, and the author. This factor, in the author's judgment, is fundamental in any systematic effort to improve the reading rate. As one learns best to do a thing by *doing* it, so one learns best to read rapidly by practice in rapid silent reading itself. All other devices are auxiliary and secondary to this fundamental type of training. The method of training in rapid reading devised by the author which effected a marked increase in speed, will be outlined later.

2. **Decrease of Vocalization in Silent Reading.**—The results of the experiments of Quantz, C. T. Gray, Abell, Dodge, Huey, and the author show the retarding influence exercised by elaborate movements of the tongue, lips, throat, vocal chords, and the general musculature of articulation, and the gain in rate that results from the decrease in such movements. Even aside from the experimental evidence presented by these investigators, it is apparent that if visualization in reading must wait upon the slower and more cumbrous process of vocalization, involving such an elaborate musculature, the reading rate must suffer. In the reading of most people some form of inner speech is present. The problem is not necessarily to eradicate inner speech entirely—for that may not always be possible—but to decrease and abbreviate it until it becomes shad-

owy, slight and vestigial. A type of training to decrease vocalization and to increase the speed, which proved effective in the investigation conducted by the author, will be sketched later.

3. **Training in Perception.**—As has been previously pointed out, reading on the psychological side consists of a series of pauses and jerks. Of the total reading time from twelve-thirteenths to twenty-three twenty-fourths is consumed in the fixation pauses. Training, therefore, which will lessen the number of fixation pauses by widening the visual span will quicken the reading rate. Training in perception by means of exposure exercises is reported by C. T. Gray as improving the rate. The flash card exercises used in the primary grades, by training pupils to read whole words, phrases and short sentences at a single glance are likewise effective in increasing the reading rate.

4. **Character of Subject Matter.**—Simple easy material will naturally be read more rapidly than difficult material. Dearborn has also shown that familiarity with the subject matter is an important item in increasing speed. A mathematician, a teacher in a secondary school and a psychologist were all found to read material in their respective fields more rapidly than subject matter in other lines. It is a safe generalization, therefore, that

simple, interesting, familiar material provokes rapidity in reading, while difficult, abstract, unfamiliar subject matter always retards.

5. Habits of Eye-movement.—As a general rule, rapidity of reading is characterized by regular, progressive, uniform, rhythmical eye-movements in contrast to the irregular movements and the frequent regressions of the stumbling, halting reader. The evidence presented by Dearborn, C. E. Gray, Smith, Huey, Judd, and the author, shows that rapid reading necessitates the proper type of eye-movement habits. Moreover, it is probable that training in regular rhythmical movements of the eyes across the printed line tends also to enlarge the perceptual span or at least to utilize it more effectively by decreasing the amount of the overlapping of the visual spans in reading. "The *perceptual* span" says Fordyce, "increases with the *ocular* span."

6. Purpose for Which Subject Matter Is Read.—This factor exercises a marked influence upon the rate. In their investigation of skimming, Whipple and Curtis found that a considerable "slowing down" resulted when the readers knew they would be required to reproduce. Reading simply to "get the gist" induces a radically different mental attitude than reading to answer detailed questions on the context. The mental "set," the entire mode

of attack, the degree of concentration, all of which influence the rate, will depend largely upon the purpose for which the reading is done. In the development of habits of rapid reading, it seems advisable to place a simple end before the pupils, such as "getting the gist" of the material. As the reading ability develops, the ends may be multiplied, until they reflect the actual variety of purposes for which reading is done outside of the school.

7. **Concentration of Attention.**—It is the experience of most readers that the rapidity of reading bears a direct relation to the degree of concentration. Other things being equal, the greater the concentration, the faster the reading. Because it inhibits tendencies to wool-gathering, and the infiltration of extraneous material into the mind, concentration insures both a more rapid and a more accurate grasp of material read. In order to secure concentration, especially with young pupils, interesting material within the range of their experience must be chosen. Otherwise the material receives only the volatile fluctuating attention of the reader, to the detriment of the rate. All the evidence, experimental and *a priori*, indicates the prime importance of concentration in the improvement of reading rate.

8. **Ability to Grasp the Contents.**—If reading be

defined as the gathering of thought from printed symbols, it follows that reading in the last analysis is a mental process. The ability with which the symbols are interpreted, and the proper associations aroused for the assimilation of the material, will naturally influence the reading rate. In the opinion of Ruexbiger, the chief operation in reading is not the process of "getting the material to the brain, but of assimilating it after it is there." In the development of habits of rapid reading, the material should not make too great demands upon the interpretative powers, but should be well within the pupil's ability to assimilate.

9. **Recognition of the Value of Rapid Reading.**— Probably the chief reason why more people have not acquired the habit of rapid reading has been due to the twofold failure, first, to recognize the possibility of developing such a habit, and, secondly, to avert to its value. This is traceable to the fact that the discovery of the possibility of accelerating one's reading rate to an appreciable degree, is the outcome of investigations of comparatively recent date. In the investigation conducted by the author, it was found that from the recognition of the possibility of acquiring such a habit and its value, there sprung concentration of mind, enthusiasm, and sustained interest in the efforts to develop such an ability.

10. **Will to Read Rapidly.**—Growing logically out of the preceding factor, is the will to read rapidly. It seems important enough, however, to be listed separately. The literature on the subject contains several instances of persons such as Huey, Fordyce, and others, who determined rather simply to speed up their reading and who actually succeeded in bringing it up to a higher level. The determination to improve the rate effects a change in the whole mental attitude. It shoots the attention rapidly over the subject matter and replaces listlessness with spirit and dynamic energy. It is the conviction of the writer, based upon his investigation, that practically anyone who strongly wills to increase his reading rate, can actually do so—provided, of course, he employs some suitable means. Unless this factor has first been enlisted, the undertaking in spite of endless technique and elaborately worked out methods, is foredoomed to failure.

11. **Pressure of a Time Control.**—By this factor is meant simply that the rate of a pupil's reading is measured by a clock or watch. The consciousness that he is being timed, not only tends to inhibit dawdling and day-dreaming, but increases the concentration and spurs him on to greater speed. The consciousness of a reliable objective check on any performance serves as a wholesome prophylactic

against careless, slovenly, half-hearted work, and provokes the maximum of ability. In the author's investigation, the pressure of a time control serves as a very effective spur towards enlisting one's whole conscious attention and the maximum of energetic efforts.

12. **Individual Graph.**—The knowledge of the result of any effort is helpful and directive. When that information is placed, not simply in figures, but is translated into a graph, the record becomes more impressive. A single line, rising or falling, tells the pupil the whole story of his success or failure. It is so simple it can be comprehended at a glance. The zest of a game, the spirit of a combat is aroused, it evokes the determination to "make that line go up." It is a device of demonstrated value in stimulating the best efforts of pupils to develop rapid silent reading ability.

13. **Class Chart.**—This serves as a supplement to the individual chart. Besides portraying the average performance of the class, the chart also discloses the highest and the lowest individual record for each day. This shows the variation among the members within the class, and indicates the room for improvement. It stimulates both the slow and the rapid reader—the slow in the effort to escape from the bottom rung of the ladder and to lessen their

retarding influence on the class average, and the rapid to achieve new heights.

The class chart allows comparisons to be made between the improvements effected by different classes within the same school and between the same grades in different schools in the city or elsewhere. The motive, moreover, which the class chart brings into play, is of the wholesome, social type,—loyalty and interest in the progress of the *class as a whole.* By creating a commendable *esprit de corps,* it enlists the continued interest of the class as a unit in the achievement of the desired end in the experiment, namely, the development of rapidity in silent reading.

These are the important factors in the development of speed and fluency in silent reading which are susceptible of incorporation into methods of training. Other factors, such as the size and character of print, the gloss of the paper and other items of a mechanical nature are not susceptible to incorporation in different types of technique in training and are therefore not discussed. So likewise the reader's native reaction time, as well as his dominant type of imagery, are omitted in this discussion because they are usually beyond the scope of the teacher's power to modify directly.

The remainder of this chapter will discuss the

three types of training in rapid silent reading: (1) Practice in Rapid Silent Reading; (2) Training to Decrease Vocalization; (3) Training in Perception.

1. Practice in Rapid Silent Reading

Of the thirteen factors in the development of rapidity in reading, which were enumerated above, the most important single factor is direct training in rapid silent reading itself. All the others are auxiliary and supplementary to this basic factor, which constitutes the direct synthetic mode of attack—training in the whole organized process of reading itself. The results of the investigation conducted by the author show that this type of training was instrumental in effecting marked increases in the reading rate, not infrequently doubling the speed without impairing the comprehension. Because of the comparative recency of the recognition by the school of the value of rapidity in reading, and the consequent paucity of carefully worked out methods to develop such ability, the technique worked out by the author and used with marked success in forty classrooms in ten different cities in Illinois will be briefly outlined. The details of the method may be modified to suit different classroom conditions. Instead of simply pointing out the

value of rapidity in reading, and then compelling the teacher to stand or fall, according to her ingenuity and ability to plan a definite technique to increase the reading rate, the method offers a helpful concrete basis for the practical application of the teacher's skill and energy.

Statement of Method.—Training in rapid silent reading should replace the regular work in reading and no other classroom time should be devoted to reading. Thirty minutes per day should be allowed for the work. Since the time element enters into all the work, a clock should be placed in the front of the classroom so that it can be seen by all the pupils. The method should consist essentially of alternate reading and reproduction. The reading should be timed and a measure of the amount read in the time allowed should be regularly taken. Pupils should be kept informed of their speed of reading. Reproduction should consist both of free paraphrase—orally, or in writing—and of answers to specific questions based on the text. The length of the reading period and of the reproduction period should vary with the grade of the pupils and with the subject matter. In general, however, the reproduction should not occupy more than one-quarter of the total time allowed for the exercise.

Only interesting material should be selected. It

should also be easily within the understanding of the pupils. Since the object is to set up habits of rapid reading, emphasis upon the simplicity of the selection is necessary.

Preparation.—In order to assist the pupils in covering as much reading matter as possible, a definite preparation may be made consisting: (a) of thought preparation, or (b) of word preparation, or (c) of both. The thought preparation should consist of such an introduction by commentary or by the question-answer process as will arouse interest and enlist the attention of the pupils. This preparation should in no case be long. For the word preparation, the teacher should select such words as in her judgment would be unfamiliar to the pupils, and should present them briefly, explaining their meaning. The preparation—both thought and word—may be abridged or even omitted when the material is such as to give no difficulty. In no case should the preparation occupy more than five minutes of the thirty assigned to the exercise.

Each pupil should keep a chart of his daily performance, and a complete chart of the daily class performance should be conspicuously displayed in the classroom.

Directions to Pupils.—It is desirable that the di-

rections to pupils given by each teacher concerned in this training be substantially the same. The following points are suggested to indicate the nature of the directions. Literal adherence to them is not requested. Their spirit, however, should be maintained.

Point out the advantage of a rapid rate of reading. Try to get the children to see this in terms of an addition to their own interests and pleasure. Carefully direct them where to begin the assignment of the day. See that they all begin at the same time and at the same place in the text. Say in substance: "Read it as fast as you can. I want to see how much you can read in two (or three) minutes. But remember that I am going to ask you to tell me about what you have read so do not skip anything. Try to read faster today than you did yesterday." See that the pupils have a pencil at hand and direct them to stop reading at once as soon as you say "stop." Direct them then to mark the end of the line which they are reading when told to stop. Pupils may now reproduce what they have read as indicated above. In a similar manner, reading and reproduction are to be continued till the end of the thirty minutes assigned. Have the pupils then report the number of pages and lines beyond the last full page which they read.

As part of your preparation for the exercise you will be expected to know the average number of words per line in the matter which is being read and the number of lines per page (if pages are broken by illustrations, or for other reasons, special account of these pages will have to be taken). From the pupils' reports as to pages and lines read, on this and subsequent assignments for the day, estimate the number of words read that day and divide by the total number of words read per minute. Each pupil should figure out his own score, and should immediately enter it upon the chart, which will thus serve as a record of his daily progress in silent reading.

2. Training to Decrease Vocalization

The second type of training was designed to decrease the amount of inner speech accompanying silent reading. Inner speech with its more or less elaborate movements of the tongue, lips, vocal chords, pharynx, inner palate, throat, and the general musculature of articulation, has been shown to exercise a retarding influence on silent reading rate. It makes visualization wait upon the slower and more cumbrous process of vocalization. This type of training, while aiming to decrease the vocalization, also employs practice in rapid silent reading,

along with all the other supplementary devices previously described. It differs from the previous method only in that it adds to the previous method the conscious effort to minimize inner vocalization. Like the previous method this type of training is pushing ahead the reading rate to a marked degree.

Statement of Method to Decrease Vocalization in Silent Reading.—Vocalization may show itself in rather extreme form by elaborate lip-movement, or in its usual form, by incipient movements of the lips, tongue, pharynx, vocal chords, and the general mechanism of the throat. The reader feels or hears himself pronouncing the words. This constitutes the so-called "inner speech" of silent reading. Inner speech is present in some form in the reading of most pupils.

Inner speech has the effect of slowing up the rate of reading, causing the individual to read no faster than he can actually pronounce the words to himself. Hence, perception must wait upon pronunciation. The rate of reading, in other words, is made dependent upon the rate of inner speech. If this process of vocalization be gradually lessened and finally eliminated, the rate of silent reading may be greatly accelerated. Training to decrease vocalization should replace the regular work in reading

and no other classroom time should be devoted to reading. Thirty minutes per day should be allowed for the work.

It is desirable that the directions to pupils given by each teacher concerned in this training be substantially the same. The following suggestions are offered, indicating the nature of the directions to be given by the pupils. Literal adherence to them is not required. Their spirit, however, should be maintained.

Instructions to Pupils

Point out the advantage of a rapid rate of reading. Tell them that their effort to read rapidly will be more successful if they avoid moving their lips and tongue and do not attempt to pronounce each word to themselves. For, it is precisely this attempt to pronounce each word which slows up the rate of reading. Articulation of words in silent reading, therefore, is a serious hindrance to rapid silent reading, which should be eliminated in the interests of efficiency. Try to get the children to see that their speed and efficiency in silent reading will depend largely upon their elimination of inner speech.

Say to them in substance: "Read this selection as fast as you can. While reading do not move

your lips or tongue. Do not pronounce the words to yourself, as that will cause you to read more slowly than you otherwise would. I want to see how much you can read in [1]— minutes. But do not skip anything, as I am going to ask you to tell me about the story you have read. Try to read faster today than you did yesterday."

See that the pupils have a pencil at hand and direct them to stop reading at once as soon as you say "stop." Direct them to mark the end of the line which they are reading when told to stop. Pupils may now reproduce what they have read, as indicated above. In a similar manner, reading and reproduction are to be continued until the end of the 30 minutes assigned. Have the pupils then report the number of pages and lines beyond the last full page which they read.

Teacher's Preparation.—As part of your preparation for the exercise you will be expected to know the average number of words per line in the matter which is being read and the number of lines per page (if pages are broken by illustrations or for other reasons, special account of these pages will have to be taken). From the pupils' reports as to pages and lines read each day, estimate the number

[1] Number of minutes to be varied by the teacher, as two minutes for one reading stretch, three minutes for another, etc.

of words read that day and divide by the total number of minutes used in reading. This will give the number of words read per minute by each pupil. Each student should figure out his score, and should immediately enter it upon the chart, which will thus serve as a record of the pupil's daily progress in silent reading. The teacher is also requested to keep a diary in which she will daily record notes and observations concerning the progress of the experiment.

3. Training in Perception

The core of the reading complex is the process of perception. The movement of the eyes from pause to pause, their convergence and divergence in fixation, the numerous and varied play of the neuromusclar mechanism involved in the ocular adjustment to the printed symbols are all subsidiary to the main process of perception. The latter constitutes the actually seeing or vizualization of the printed words. It occurs during the fixation pause and consumes nearly all of the time spent in reading.

Perception in reading is twofold, foveal and peripheral. Foveal perception during a single fixation pause embraces only about five or six letters in

"unequivocally clear vision." The adjoining letters shade off into a hazy outline, and are faintly grasped by peripheral vision. The effective utilization of the latter which covers a wide area, lessens the number of direct fixation pauses necessary to read a printed line. Reading which is wholly or chiefly dependent upon foveal vision, will be slow and halting, marred by too frequent pauses. These pauses inhibit the development of a regular rhythmical swing of the eyes in traversing the printed line.

Extra-Foveal Vision.—Dodge, who has analyzed the functioning of the various elements in the reading complex with marked acuteness, thus describes the work of extra-foveal vision.

"Sometimes the peripheral vision of words, when they are indistinctly seen in the hazy part of a line, is sufficient for reading. It is always useful, furnishing an important premonition of coming words and phrases, as well as a consciousness of the relation of the immediately fixated symbols to the larger groups of phrase and sentence. Without this premonition of coming words and the outlines of larger groups, the process of reading would be slow and difficult.

"In normal reading there is abundant evidence that the word forms, indistinctly seen in peripheral

vision, begin the reading process well in advance of direct fixation and the consequent clearing up of the letters.

"It is this premonition of coming words and phrases, sentence breaks, and paragraphs, that determines the position of future fixations, and reduces the duration of individual fixations sometimes to pauses one-quarter the normal perception time. They are often less than the simple reaction time of the eye."

Not only is peripheral vision effective in decreasing the number and duration of the fixation-pauses per line and consequently in accelerating the rate, but it is also instrumental in fostering and stimulating meaning premonitions, thereby improving comprehension as well. Hand in hand with the reaching out of perception beyond the immediate field of clear vision seems to go the reaching ahead of the assimilative factor beyond the meaning grasped in direct fixation to those dimly felt in the extra-foveal area. Meaning premonitions, made more numerous and more vigorous by the functioning of a wide peripheral vision, play an important rôle in the rapid interpretation of the printed page. Just as extra-foveal vision frequently suffices for the reading of a word without the agency of direct

fixation, so meaning premonitions not infrequently carry the reader over many a word without the immediate apprehension of the word in direct fixation. This is evidenced by the fact that a person in reading a selection aloud in which the meaning premonitions stream thick and fast into his consciousness will unwittingly substitute a synonym for the word actually occurring in the passage.

Meaning Premonitions.—Concerning the importance of these meaning premonitions, Dodge says:

"Adequate premonitions are as conspicuously lacking in the stumbling reading of childhood as in our reading of a foreign language. Their development is a most important part of the training in rapid reading. The very rapid reader who makes two or three stops in a line can see no more distinctly than the plodder with ten. *His main advantage is in the way he grasps what he sees only indistinctly in the extra-fixational vision.*" (Italics inserted.)

The training in perception which is outlined below was designed to develop the more generous utilization of peripheral vision, and of its mental correlate —meaning premonitions. The direction to the pupils in the exposure exercises, requesting them to read the sentence "as a whole," allowing time sufficient for but a single fixation, was calculated to

call the peripheral vision into play, while the suggestion to look up occasionally and tell "how much they saw ahead" and how much of the remaining meaning of the sentence they could give, was designed to develop meaning premonitions along with the extra-foveal vision.

Foveal Vision.—However important a factor peripheral vision may be in developing rapid, effective reading, direct or foveal vision still constitutes the core of the perceptual process—perception *per se*. In the field of clear vision it is not a matter of conjectural interpretation or inferences from previously perceived premises, but a matter of direct fixation and immediate apprehension. The functioning of direct fixation in connection with extra-foveal vision, Dodge thus describes:

"In adult reading the moment of actual fixation seems to be an incident somewhere in the middle of the reading process. Coming between the premonition and the after echo, its effect is to correct, to confirm, and to intensify the premonition. Psychologically its function is selective and definitive. It emphasizes the excitation of suitable residua and inhibits the misfits. The pedagogical importance of word forms is clear. It is possible that special training in peripheral vision would be worth while, but it is equally evident that no training is adequate

which does not provide for the corrective coöperation of direct fixation."

Because of a lack of proper exposure instruments with delicate timing devices necessary in a scientific experiment, the method of training in perception that will be outlined here, was not used in the investigation conducted by the author. The substance of the method has been used with success, however, by a number of classes. The method is suggested especially for the lower grades. Being flexible, the skillful teacher can adapt it to suit the needs of her particular class. The method involving the supplementary devices used in the two preceding types of training, but focusing attention on the perceptual processes, may be outlined as follows:

Statement of Method.—The cards used should be four inches wide and of varying lengths to contain words, phrases, or sentences.

The use of these cards is analogous to that of the exposure of material in laboratory work by means of an exposure apparatus or tachistoscope. In both cases, the subject is required to perceive the material exposed in as short a time as possible. There is experimental evidence tending to show that the amount of verbal material which a person can perceive in a given time can be increased—in other words, that perception as a native endowment may

be improved, but the method of using the native endowment—*i. e.* the performance,—is susceptible of extensive improvement.

The rate at which children can perceive words, phrases, and sentences has a rather obvious bearing on their speed of reading. Reading consists of a successive series of perceptions. The eye does not move regularly along the printed line but jumps from one point to another, pausing at each point. It is during the pause that perception takes place. In a very real sense, therefore, the printed line consists of a series of flashes or exposures.

The Fundamental Idea.—To improve the rate of reading, therefore, we need to reduce the number of exposures per line by increasing the amount of material presented at each exposure and to shorten the length of each exposure. This suggests that we may directly attack the problem of increasing the speed of reading, (a) by training the pupil to "see more at a glance," and (b) by training him to see the material more quickly.

Obviously, we cannot control either the amount seen at a glance or the time of the exposure by using the printed page. If, however, we can present, by means of perception cards, portions of the text in the form of words, phrases, and sentences,

we may gradually lengthen the amount of material on the cards as the pupil's ability to perceive it increases, and we may also reduce the time during which it is placed in view.

This is the fundamental idea in the method we are now proposing.

The reading period should be thirty minutes long. Half the period should be devoted to the presentation of material by means of the perception cards. The remainder of the period should be devoted to reading from the book in which, as far as possible, the same words, phrases, and sentences are met.

During the first half of the period the attempt should always be to make the period of exposure of the cards as short as possible. Day by day the length of the material should be increased. In fact, either one of two methods may be used and both should be used during the course of the experiment: (a) the time of exposure may be kept constant and the length of the material may be increased; (b) the length of the material may be kept constant and the time decreased.

In order to obviate as far as possible any interference with the perceptive processes due to the presence of unfamiliar words, the teacher should drill on single words which she has reason to believe

are unknown to a number of children. These words may be placed on the board or presented in the usual manner.

The Transfer of Perception to Printed Page.—The second part of the period should be devoted to a conscious attempt on the part of the teacher to secure a transfer of the perception processes from the cards to the printed page. When a phrase or sentence is encountered, children should be told that the phrase or sentence is to be "seen all together." Such directions as "do not look at every word," "see it as a whole," "read it all together," may serve to carry over from the work with the cards to the work in the book something of the same attitude.

An accurate record of the progress of the pupils should be kept so that the increase in perceptual span and in rapidity of perception may be noted. A simple form can be provided for this purpose. The teacher is also requested to keep a diary in which she will daily record notes and observations concerning the progress of the experiment.

The teacher should select easy reading material for use during this experiment in order that the difficulty due to unfamiliar words may be reduced. In all the reading other than that done in the half hours set aside for the experiment, the teacher

should seek by admonition, encouragement, and example to inculcate the idea of increasing the span of perception—*e. g.*, reading by phrases—and to decrease the time required to "look at" a group of words. An interesting exercise may be devised in which pupils may be requested to glance at the first words of a paragraph and immediately raise their eyes, whereupon they may tell "how much they saw."

Instructions to Pupils In Perception.—The following suggestions are offered, indicating the nature of the directions to be given to the pupils. Literal adherence to them is not requested. Point out the advantage of a rapid rate of reading. Try to get them to see this in terms of an addition to their own interests and pleasure. Say to them in substance: "I shall show you some cards containing words, phrases, and sentences. They will be shown for only a fraction of a second. So you will have to read them very quickly, with a single glance of the eyes. Try to read all that is printed on each card. You will have to pay very close attention when I show you the card, as otherwise you will not be able to read all that is on the card. This practice in reading a number of words at a glance will help you to read more rapidly. Try to do better than you did yesterday."

Spend about fifteen minutes in perception card training. After each exposure ask some of the pupils what was printed on the card. Toward the end of the training in perception, have all the pupils reproduce in writing what was on each of the five last cards exposed. The percentage of words correctly reproduced will constitute the pupil's score in perception. State the total number of words exposed on the five cards and it will then be easy for each pupil to figure out his own score. Direct each pupil to enter his score immediately upon the chart that each pupil will keep for that purpose.

The second half of the period should now be devoted to rapid silent reading. The pupils should be encouraged to carry over the habit of "seeing many words at a glance" gained by their training in perception, into the actual work of silent reading. They should be directed to "run their eye across a line of words" as rapidly as they can, consistently of course, with an understanding of what they see. Throughout this reading period there should be a conscious effort to utilize the habit acquired through training in perception, by perceiving several words at each fixation, instead of but a single word. This should result in an increased rate of speed in silent reading.

Instructions to Pupils in Reading.—Say to the pupils in substance: "Read this selection as fast as you can. I want to see how much you can read in ——[2] minutes. Try to see as much as you can read in a single glance, running your eyes rapidly across the lines. A fast, regular, rhythmical movement of the eyes will help you to read rapidly. But remember that I am going to ask you to tell me about the matter you have read, so do not skip anything. Try to read faster today than you did yesterday."

See that the pupils have a pencil at hand and direct them to stop reading at once as soon as you say "stop." Direct them then to mark the end of the line which they are reading when told to stop. Pupils may now reproduce what they have read. Reproduction should consist both of free paraphrase—orally, or in writing—and of answers to specific questions based on the text. The length of the reading period and of the reproduction period should vary with the grade of the pupils and with the subject matter. In general, however, the reproduction should not occupy more than one-quarter of the total time allowed for the exercise. Reading and reproduction are to be continued till the end of the fifteen minutes assigned. Have the pupils then re-

[2] Number of minutes, say, two, three, or four, to be determined by the teacher.

port the number of pages and lines beyond the last full page which they read.

Teacher's Preparation.—As part of your preparation for the exercise you will be expected to know the average number of words per line in the matter which is being read and the number of lines per page (if pages are broken by illustrations or for other reasons, special account of these pages will have to be taken). From the pupils' reports as to pages and lines read on this and subsequent assignments for the day, estimate the number of words read that day and divide by the total number of minutes used in reading. This will give the number of words read per minute by each pupil. Each student should figure out his own score and should enter it immediately on the chart on which he has already written his perception score. This chart will thus serve as a record of the pupil's daily progress.

It is also suggested that a complete chart of the daily class performance might be conspicuously displayed in the classroom.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. How may comprehension in reading be improved? Outline suitable exercises.

2. Describe the chief factors influencing rate of silent reading.

3. How would you rank these factors in the order of their importance?

4. What are the investigations which point to the significance of each factor mentioned in the development of speed in silent reading?

5. What are the chief characteristics of the first type of training in rapid silent reading?

6. Apply this method to a class of elementary school pupils, and measure the improvement resulting. Do the same with a group of high school pupils, and with adults.

7. What additional factor does the second type of training utilize, which was not used in the first method of training?

8. What is the basic principle in the third type of training?

9. See how much improvement in rate you can effect in your own reading within three months by a half hour's practice each day in rapid silent reading.

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CHAPTER XI

IMPROVEMENT IN READING EFFECTED BY TRAINING

The two methods, training in rapid silent reading, and training to decrease vocalization, described in the previous chapter, were applied to forty classes in twenty schools in nine cities in Illinois. The pupils in each class were divided on the basis of the scores achieved in the Courtis Silent Reading Test, into two groups of equal ability. One half of the class received the experimental training, while the other half received the conventional treatment. The first half was called the experimental group; the second, the "control" group.

Moreover, the pupils were so paired, that for each pupil in the experimental group there was a corresponding pupil of the same reading ability in the "control" group. This afforded both a class control and an individual control. By this means it was possible to determine accurately the relative superiority of the experimental training over the conventional type of reading instruction.

Thirty minutes a day, extending over a period of thirty-nine school days, were devoted to the work in reading. The Courtis Silent Reading Test was administered at the beginning, middle, and end of the experiment.

The results of the training given to the experimental group in the five grades, fourth to eighth inclusive, as compared with the "control" group, are presented in Table 10.

The Results.—A glance at Table 10 shows that the experimental pupils have made progress in reading far superior to the "control" pupils. Reducing the average gains in number of words read per minute to a percentage basis, it becomes possible to express the amount of improvement for the experimental pupils in all the grades in a single term—56 percent as compared with 25 percent for all the "control" pupils. This shows a final average superiority in gain for the experimental pupils over their checkmates of 31 percent. In terms of the number of words read per minute, the average gain of the experimental group is 110.2 as against 46.2 for the "control" group—an average superiority in gain of sixty-four words per minute in favor of the pupils receiving the experimental training above described.

TABLE 10

SHOWING AVERAGE RATE OF READING FOR EXPERIMENTAL (A) AND "CONTROL" (B) PUPILS AT BEGINNING AND END OF TRAINING PERIOD AS DETERMINED BY COURTIS SILENT READING TEST FOR GRADES IV–VIII

Grade	Number of Pupils	Test I		Test II	
		A	B	A	B
IV	236	155.7	155.1	241.9	189.5
V	154	190.7	191.9	265.4	225.6
VI	128	197.7	204.4	284.7	235.4
VII	206	205.6	202.5	298.5	237.2
VIII	92	220.8	211.7	361.2	290.5

	Test III		Gain		A's Superiority in Gain	
	A	B	A	B		
IV	236.4	188.2	80.7	33.1	47.6	31%
V	277.8	222.1	87.1	30.2	56.9	30%
VI	292.6	235.0	94.8	30.6	64.2	33%
VII	321.6	249.7	116.0	47.2	68.8	33%
VIII	393.0	301.8	172.2	90.1	82.1	35%

Average gain of A for all grades = 56%; of B = 25%; A's superiority over B = 31%. This table is to be read as follows: In grade IV, 236 pupils participated in the experiment. The pupils in the experimental or A group averaged 155.7 words per minute as compared with 155.1 words per minute for the control or B group on the first test at the beginning of the experiment. On Test II at the middle of the experiment, the average rate of the A pupils was 241.9 words per minute, as compared with 189.5 for the control group. At the end of the experiment, on Test III, the scores were 236.4 and 188.2 respectively. The average gain in rate for the A pupils was 80.7 words per minute as contrasted with 33.1 for the control group. The experimental pupils made an average gain of 47.6 or 31% more than the control pupils. The table is read in the same manner for all the remaining grades.

Interpretation of Results

Figure 17 illustrates the data contained in Table 10. It presents very clearly the differences in

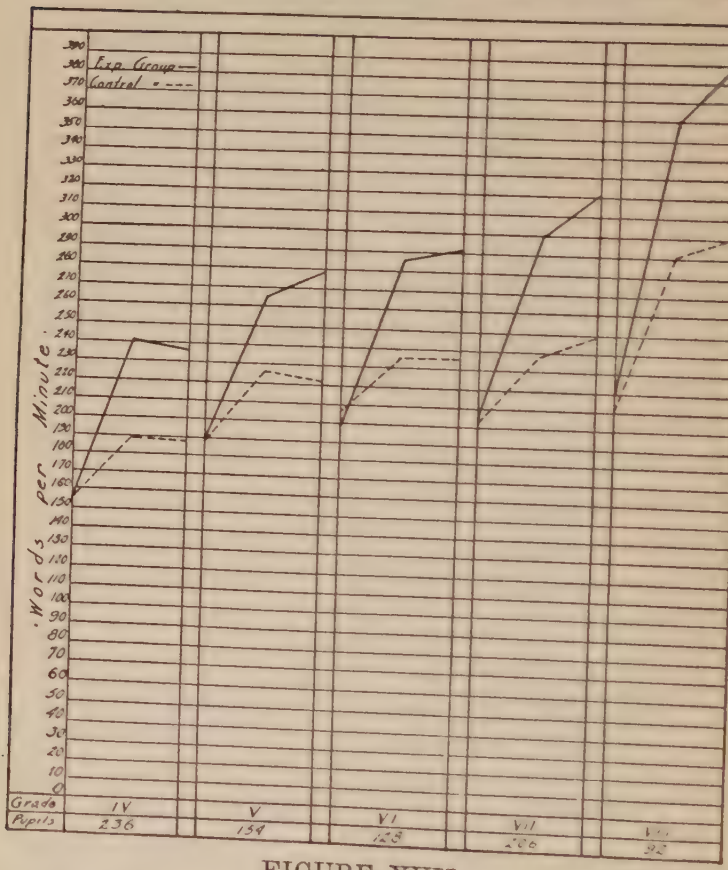

FIGURE XVII

AVERAGE RATE OF READING FOR EXPERIMENTAL (A) AND CONTROL (B) PUPILS AT BEGINNING, MIDDLE AND END OF TRAINING PERIOD AS DETERMINED BY COURTIS SILENT READING TEST

amount of improvement in reading rate achieved by the experimental pupils and the control pupils. While in every grade the two groups start at practically the same level of reading rate, yet in every grade the experimental pupils far outstrip the con-

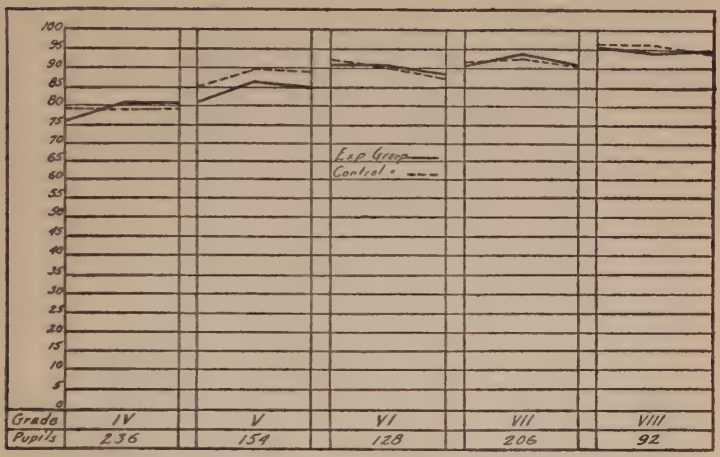

FIGURE XVIII

AVERAGE COMPREHENSION IN READING FOR EXPERIMENTAL (A) AND CONTROL (B) PUPILS AT BEGINNING, MIDDLE AND END OF TRAINING PERIOD AS DETERMINED BY COURTIS SILENT READING TEST

trols. The bulk of improvement, it will be noticed, is effected in the first month of the training. With the exception, however, of the fourth grade, in which there occurs a very slight decrease, improvement of a lesser character continues during the second month.

The decided improvement made by the pupils as a result of the first month of the training would seem to indicate that the customary reading rate of pupils was far below the rate at which they could read intelligently and efficiently. In other words, they were not working on the maximum plane of efficiency. Thus the pupils in the seventh grade are able to increase their rate 116 words per minute, while the eighth-grade pupils succeed in almost doubling their rate—without in either case experiencing any appreciable decrease in comprehension. In fact, in one case, a slight improvement is effected. This result gives some point to the query: Is not the reading of most individuals done at slow, plodding rates which are far below the levels attainable by a little training? The results portrayed in Figure 17 point strongly in that direction.

The Effect upon Comprehension.—That the comprehension has not been greatly affected either favorably or adversely is shown by Figure 18. The comprehension remained constant to a large extent in both the experimental and control groups. The slight superiority in gain that does exist, however, is in each grade in favor of the experimental pupils. The conclusions that would seem to follow from the performances of the pupils in comprehension in this study are:

1. Marked increases in speed of reading may be effected without any impairment of the comprehension.

2. The setting up of habits of rapid reading does not *per se* increase the accuracy of the comprehension.

3. To secure marked improvement in accuracy of comprehension special stress must be placed upon training designed specifically to increase the accuracy of the comprehension.

While the experimental training outlined in this study succeeded in safeguarding, and even slightly

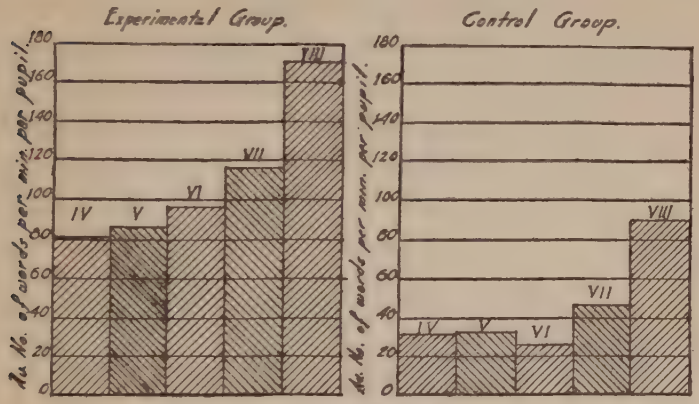

FIGURE XIX

AVERAGE GAIN IN RATE OF READING FOR GRADES IV TO VIII AS DETERMINED BY COURTIS SILENT READING TEST

improving, the accuracy of the comprehension, yet its predominant effect was the marked acceleration of the reading rate. To produce such an effect upon the rate was precisely the end for which the training was devised.

The Relative Amount of Gain Made by Different

Grades.—A comparison of the amount of gain in rate made by the experimental and control pupils in each of the grades is given in Figure 19. The graph brings out clearly the fact that *the amount of gain increases as the grade advances.* In every case in the experimental groups the gain made by the higher grade is superior to that made by the lower. With the single exception of the sixth grade, this is true likewise of the "control" groups.

This superiority in gain in rate by the upper grades over the lower is quite the opposite of what has usually been reported concerning the relative gains made by the different grades. The third and fourth grades have been of late generally regarded as the crucial school periods during which the appreciable increases in rate of reading are to be effected. The results reported by W. S. Gray, Judd, Courtis, and Waldo have shown that *de facto* the important gains are made in the lower grades, especially in the third and fourth. What is the explanation of the difference of the relative amount of gain made by the different grades as reported by other investigators and those reported in the present study? In the author's judgment the explanation is not far to seek.

The gains reported by other investigators were the results of the conventional type of training in

reading with almost the entire emphasis upon the oral phase. The matter of rapidity in silent reading had not as yet become a problem in the minds of the majority of upper grade teachers, much less in the minds of their pupils. During the third and fourth grades, great stress is placed by the teachers upon the mastery of the mechanics of reading. Generous portions of time are devoted to this task. After this has been accomplished, the pupils are allowed to slumber along at the slow, dead-level plodding rates which became fixed for them in the days of sempiternal drill in oral reading. Reading from the fourth grade on continues largely as an exhibition of word pronouncing, articulation, etc. As Judd aptly phrases it, "The conscientious teacher supplied with a reading book and a period in the program carries on the well-known reading farce in the vain hope that the efforts of unsuccessful teaching will be overcome by a liberal application of the same methods that produced the difficulties."

The value of an acceleration of the rate in silent reading never seems to dawn upon them. It is no wonder that the rate does not notably rise as the grade advances. The wonder, rather, is that the rate does not decrease as a result of the grotesquely misplaced emphasis on oral reading and the school's utter neglect of reading in the true sense of the

term—the silent interpretation of the printed symbols.

The increase effected in the upper grades as a result of almost a year's teaching of reading, as reported by K. D. Waldo, are so meager as to be scarcely perceptible—2.1 and 11.7 words in the sixth and eighth grades respectively. The rate is practically at a standstill from the fourth grade on. A condition such as this is, in the author's judgment, nothing less than pathological. It is a serious indictment of the present school régime in the teaching of reading.

In the present investigation rapidity in silent reading was made a problem. It was recognized as a value to be striven for and to be achieved through training. Figure 19 shows the results of the pupils' effort. They secured that for which they strove.

From these results three conclusions would seem to follow:

1. Marked increases in rate can be effected in the upper grades when speed in reading is made a problem in the minds of the pupils.

2. When training in rapid silent reading is given to pupils not previously trained therein, the acceleration in rate tends in a general way to advance in the grade—the higher the grade, the greater being the increase in rate.

3. The present average rates in the upper grades are unnecessarily slow, due to the absence on the part of the school of any organized effort to accelerate them.

Table 11

Comparison of Averages in Rate Attained by Pupils After Training—with Present Norms

Grade	IV	V	VI	VII	VIII
O'Brien	236	278	293	322	393
Oberholtzer	156	186	234	282	288
Courtis	160	180	220	250	280
Gary	140	166	185	198	204
Starch	144	168	192	216	240
Brown	213	269	272	279	290
Gray	180	204	216	228	234

Table 12

O'Brien's Tentative Norms for Pupils Trained in Rapid Silent Reading

Grade	Actual Average	P. E.	Suggested Norms
IV	236.4	12.13	236
V	277.8	8.37	266
VI	292.6	8.71	296
VII	321.6	7.01	326
VIII	393.0	12.77	356

Average Rates Attained by Pupils After Training Compared with Present Norms.—A comparison of the averages of the experimental pupils in grades four to eight with the norms reported by Courtis, Brown, Gray, Starch, and Oberholtzer is presented in Table XI. There is a common basis of compari-

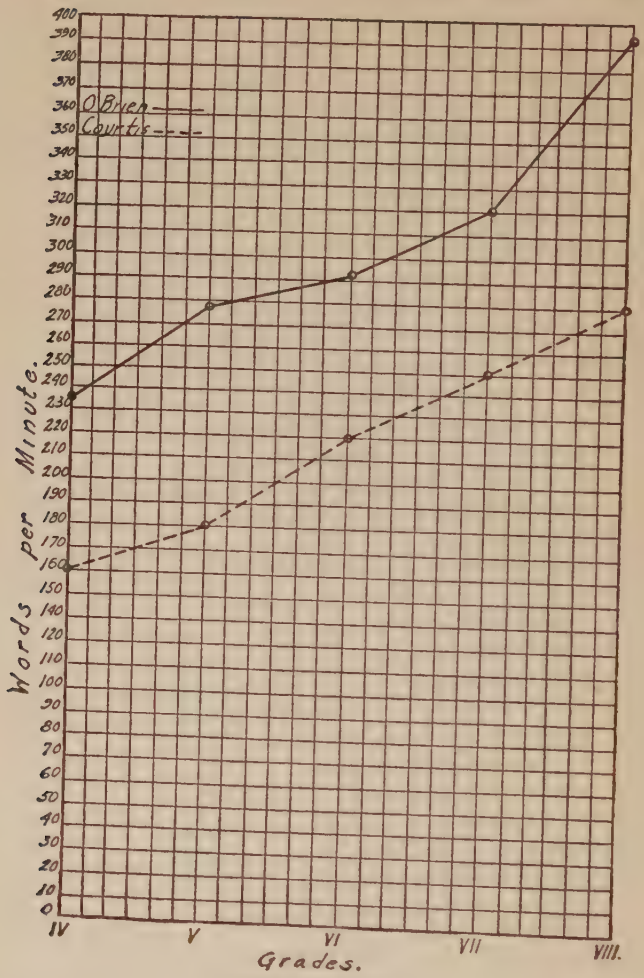

FIGURE XX

AVERAGE RATE FOR PUPILS AFTER TRAINING IN RAPID READING AS REPORTED BY O'BRIEN, COMPARED WITH NORMS REPORTED BY COURTIS FOR ORDINARY READERS

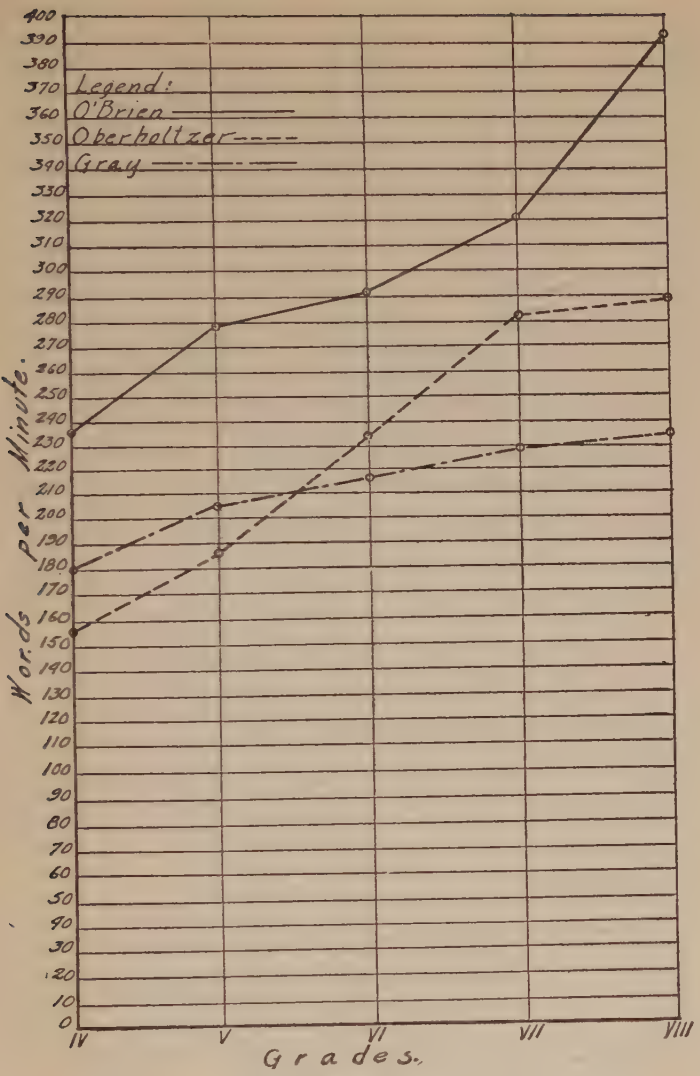

FIGURE XXI

AVERAGE RATE FOR PUPILS AFTER TRAINING IN RAPID READING AS REPORTED BY O'BRIEN, COMPARED WITH NORMS REPORTED BY OBERHOLTZER AND BY GRAY FOR ORDINARY READERS

son between the averages of the experimental pupils and the norms reported by Courtis. Both were achieved on the Courtis Test and the directions to the pupils in both cases were identical. The norms reported by Courtis represent the smoothed averages, the figures presented by the writer are the actual averages. A comparison of these two norms is shown in Figure 20. It brings out strikingly the difference in superiority in the reading rate of pupils who have received training in rapid effective silent reading and pupils who have been nurtured on the conventional *pabulum* of drill in oral reading. The superiority of the experimental pupils in every grade is very marked. Not less noticeable is the superiority over the norms reported by W. S. Gray and by Oberholtzer, as shown in Figure 21. The norms reported by Gray for the three different selections in his reading test have been adjusted here to the basis of the easiest selection, "Tiny Tad."

The highest norms reported are those by Brown. They represent, however, not the averages of all pupils tested in the different grades, as in the case of the other investigators, but the highest averages reached by various single classes, tested by Brown. Consequently, they are offered as norms or standards to be striven after rather than indices of the

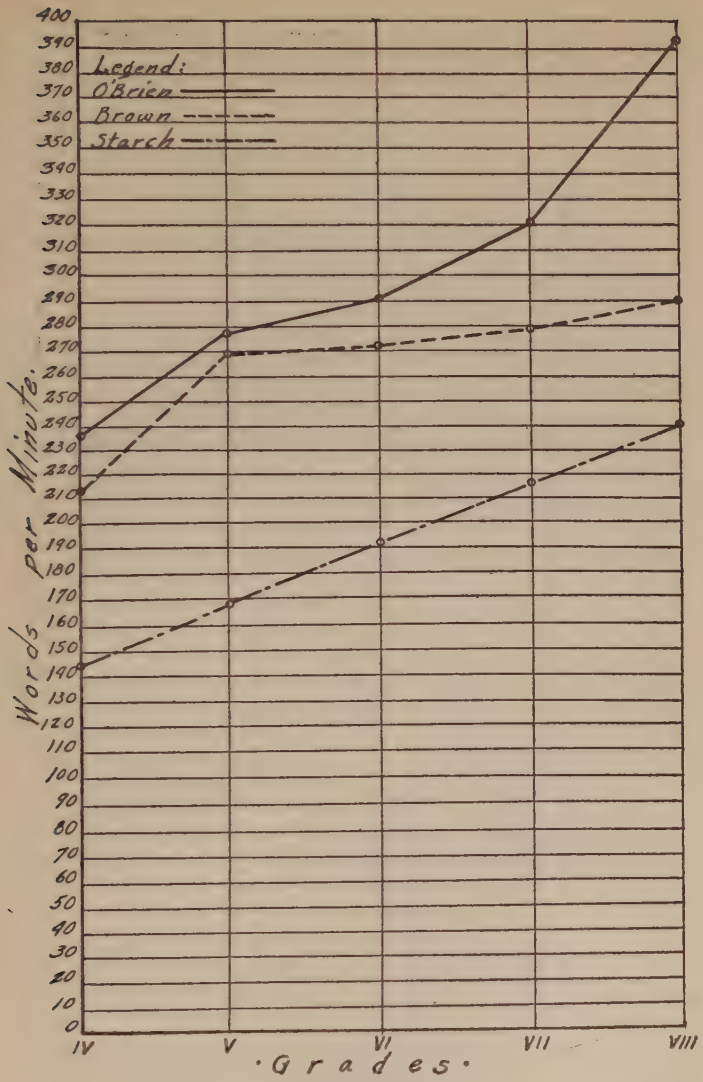

FIGURE XXII

AVERAGE RATE FOR PUPILS AFTER TRAINING IN RAPID READING AS REPORTED BY O'BRIEN, COMPARED WITH NORMS REPORTED BY BROWN AND BY STARCH FOR ORDINARY READERS

present average attainment of the different grades. These standards mentioned by Brown come closer to the averages actually reached by the experimental classes than those of any of the other investigators. They are, however, very considerably below them, as shown in Figure 22.

Tentative Norms for Pupils Trained in Rapid Silent Reading.—The present norms for reading rate have all been derived from the performances of pupils who have been trained in the conventional type of oral reading. In the vast majority of cases they have received no training in rapid silent reading. What the norms will be after the schools begin to train in rapid silent reading is an interesting question which the future alone can answer. As the result of a pioneer effort in a virgin field, the smoothed averages attained by the experimental pupils in the different grades in the present investigation are suggested as tentative norms. The degree of reliability of the averages for the different grades has been computed in terms of P. E.[1] which

[1] P. E. refers to the "probable error." As Whipple observes, "The term probable error is often a source of confusion to those unfamiliar with its uses in mathematics. For a descriptive term, we might call it the 'median deviation,' since it is that deviation that is found midway from the representative value in either direction. The magnitude in question is not, of course, the *most* probable error, neither is it in a certain sense, a 'mistake.' It is rather a 'probable sampling error': we are unable to measure every possible instance

are presented in Table 12. It is noted that the P. E. is relatively small, indicating a rather high degree of reliability for the averages.

Increase in Rate Shown by Class Charts.—Beside measuring the improvement in reading rate by the Courtis Silent Reading Test, this fact was also determined by recording the average number of words read in the reading book on each day on the class chart. The class chart gives a more detailed picture, therefore, of the gradual improvement in rapidity effected by the experimental pupils. The composite of seven fourth grade classes is shown in Figure 23. It shows that while the pupils experience reverses at times as revealed in the fall of the curve, yet on the whole there is a rather steady and consistent improvement.

The class chart for a sixth grade is shown in Figure 23. The names of the various reading books used in the experiment are shown listed on the days when they were used. Despite the wide variety of books used, there is a general upward tendency shown in the curve.

The composite of seven seventh grade class charts

of the thing we are studying, but must content ourselves with a restricted number of samples, usually so taken as to be 'random samples.' The P. E. serves to indicate the reliability of these random samples, the degree to which they probably depart from the true universal values."

is shown in Figure 24. This composite chart reflects the performances of 119 pupils. It shows that temporary standstills and even reverses mark the prog-

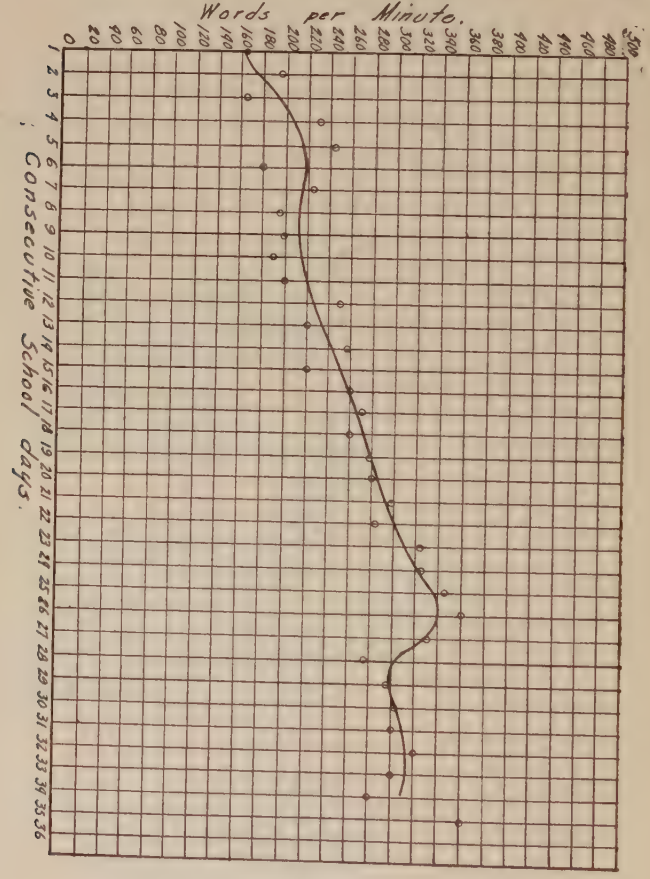

FIGURE XXIII

GRAPH SHOWING MEDIAN RATE OF READING FOR 7 FOURTH-GRADE CLASSES—117 PUPILS

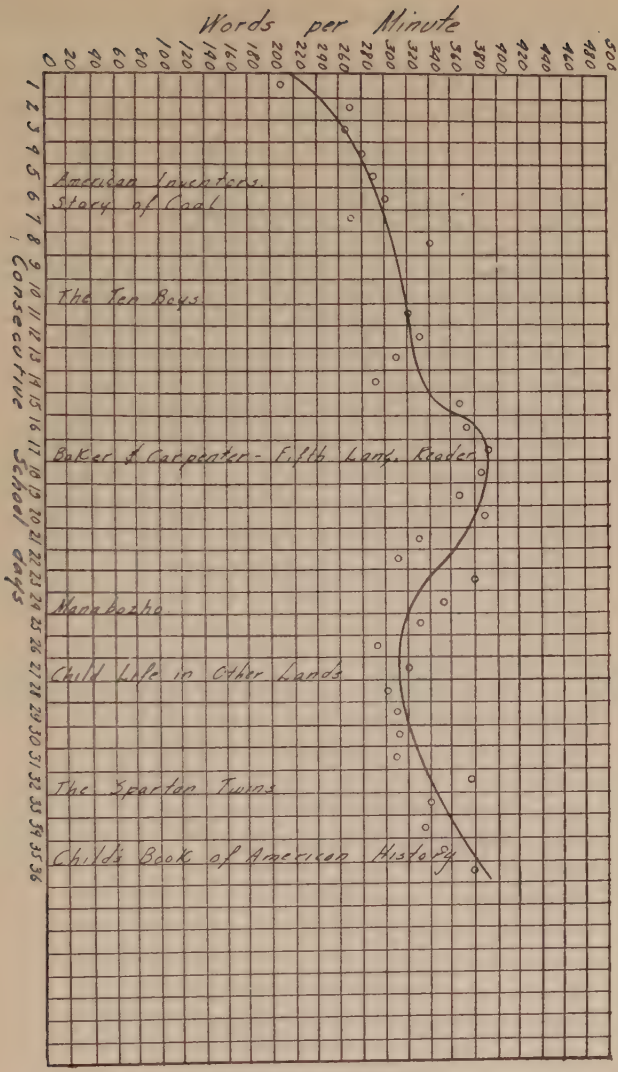
Words per Minute
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 500
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Consecutive School days
American Inventors
Story of Coal
The Ten Boys
Baker & Carpenter - Fifth Lang. Reader
Manabozho
Child Life in Other Lands
The Spartan Twins
Child's Book of American History

FIGURE XXIV

DEVELOPMENT IN SPEED OF READING BY A SIXTH-GRADE CLASS (STREATOR, ILLINOIS—GRANT SCHOOL—GRADE 6—16 PUPILS TYPE II).

ress in the development of new habits of rapid silent reading. It also shows that persistence in the training eventually brings the subjects out of the plateau

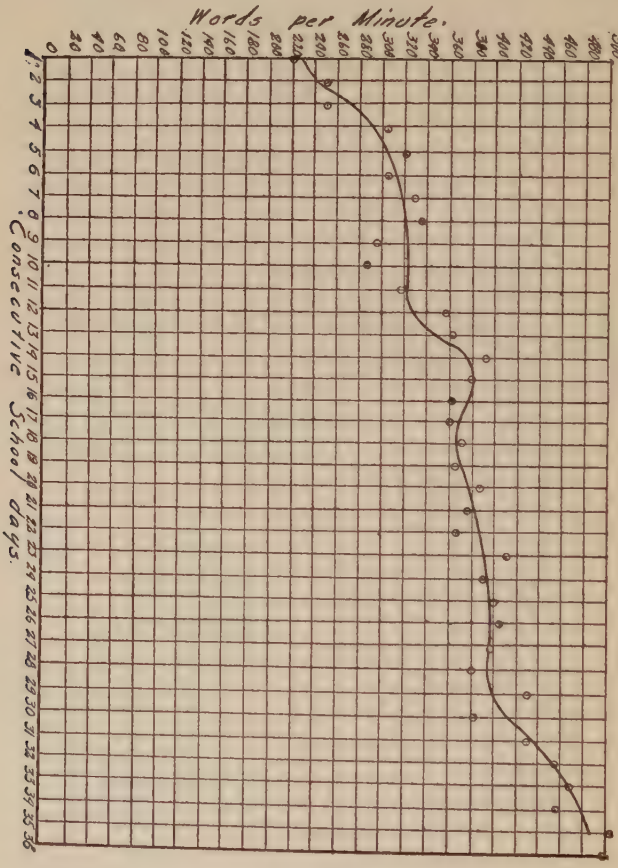

FIGURE XXV

GRAPH SHOWING MEDIAN RATE OF READING FOR 7 SEVENTH-GRADE CLASSES—119 PUPILS

into the ascending curve of ultimate progress.

The results of the investigation demonstrate conclusively that marked improvement in the rapidity of silent reading can be developed without any impairment of the comprehension. They show also that improvements averaging more than fifty per cent can be effected by training extending over a period of approximately two months. They give a considerable urge to the movement that is now under way of making definite organized efforts on the part of the school to develop not merely the old traditional oral type of reading, but that which is much more useful and important—rapid, effective silent reading ability.

PROBLEMS AND TOPICS FOR DISCUSSION AND INVESTIGATION

1. What improvement in rate was effected in the elementary grades, third to eighth inclusive, as a result of the systematic training applied in the investigation conducted by O'Brien?

2. Was the greater amount of improvement in rate effected in the lower or upper grades? What explanation can you offer for this?

3. What was the effect of the increased rapidity in reading upon the comprehension?

4. What conclusion would you draw from the fact that the great bulk of the improvement was effected in the first of the two months of training?

5. What do you think of the present average rates in reading in the upper grade? Are they unnecessarily slow? Why?

6. Compare the average rates attained by pupils after training as reported by O'Brien, with the norms reported by Oberholtzer, Courtis, Gray, Starch, Brown.

7. Compare the methods used by each investigator. Why are Brown's norms higher than all but O'Brien's?

8. Compare the improvements in rate in O'Brien's investigation, as measured by standardized tests, and as measured by the daily class charts.

9. What do you think are proper norms in rate for pupils trained in rapid silent reading?

10. Why will the incorporation of the results of scientific research in reading, into the practice of the school develop reading habits, superior in both rate and comprehension to the present ones?

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INDEX

Ability in word recognition, 234
Abstract concepts, 90
Accuracy of recognition, 232
Adjustments in reading, 115
  due to reading material, 116
Algebra reading, 125
Alphabet stage, 9 ff.
American textbook, type of, 157
Analysis in school work, 240
Analytical study, 158
Arithmetic problem complex, 174
Arithmetic reading, 165 ff.
Articulation and meaning, 152
Attention, changes in, 126
Attention span, 81 ff.; correlation with efficient reading, 81; relation to eye-voice span, 81

Belles-lettres, as reading material, 138
Buswell, G. T., 65 ff., 74 ff., 80 ff., 136, 137 ff., 155

Carlyle, T., 12
Case history, 209
Central tendency, 197
Change in methods of teaching reading in different grades, 155
Charts, diagnostic reading, 196
Class chart, 256
Cleveland Survey, 190
Clinical method, 207 f.
Clodd, E., 4, 6
Comprehension, in silent reading, 248
Concentration of attention, 253
Congenital word blindness, 215
Consciousness, 124
Content, attention to, 222
Cooke, G. W., 17 f.
Corrective treatment, benefits of, 200
Cost, comparative, of reading, 20 ff.
Courtis Reading Test, 112
Cultural value of reading, 11 ff.

Delabarre, E. B., 58
Diagnosis of individual needs, 193
Differences, individual, 238
Difficulties in reading, 207 ff.
Digits, as individuals, and in combinations, 171
Discrimination between different forms of reading, 138
Drill exercises, 220
Drill in reading, 155

Elocutionary reading, 138
English classics, 159
Experience, of child, 45 f.
Eye-movement habits, 94
Eye-movements, rhythm of, 58
  hierarchy of, 58
Eye-voice span, 64 ff.
  correlation with good reading, 66 ff.
  correlation with regressive eye-movements, 75
  when greatest improvement occurs, 73 f.
  width of, 79

Fixation movements, 51 ff.
Fixation pauses, 51 ff.
Fleming, G. L., 22
Fluent reading, 132
Foreign languages, 141
Formalism in high-school, 162
Fourth grade, time for introduction of new methods in arithmetic reading, 176
French reading, 143

Gain, relative, in grades, 288
Grammatical analysis, 137
Graphing, 186
Gray, W. S., 208
Gray's Silent Reading Test, 60 f.
Growth curves of three fundamentals of reading, 105
Growth stages in reading, 86 ff.
Guessing, in reading, 229

Habits of eye-movement, 252
Hirn, Y., 5 f.
Huey, E. B., 8 ff.

Ideograph stage, 7
Imagery, visual, 41 f.
Immaturity of reading, characteristics of, 78 f.
Improvement in reading, 281
Individual differences, 204
Individualizing instruction, 203
Ineffective eye-movements, 220
Interest, lack of, 228
Interests, of child, 47
Intermediate grades, 155 f.
Interpretation, 91

Judd, C. H., 28, 38 ff., 44 f., 137, 146, 155, 225

Keener, E. E., 214

Lack of plan in reading, 128
Latin reading, 144 f.
  teaching, 160
Library reading material, 158
Lowell, J. R., 14 ff.

McCall, W. A., 213
Mann, H., 46
Mass, G., 228
Material for reading, 45 ff., 107 f.
  affects visual span, 117
Maturity of reading, characteristics of, 76
  stages of, 83, 89 ff.
Meaning, location in reading, 77 ff.
  complex character of, 79 ff.
Meaning vocabulary, 225
Meanings, psychology of, 41 ff.
Measuring, methods of, 92 ff.
Mechanics of reading, 176 f.
Memory, auditory, 216
Mental attitudes, 119 f.
Mental confusion, 103
Methods of teaching, 149
Miller, L. W., 209
Modern psychology, 120
Muscular tension, 121

Nervous system, 120 f.
Norms, tentative, in reading, 296
Numerals in reading matter, 166

O'Brien, J. A., 59 ff., 109 f., 296 ff.
Oral reading, exclusive teaching, 33 ff.
  its value, 30 ff.
  overemphasis, 35 ff.
  physiological difference between oral and silent, 59 ff.

Paraphrasing, 144
Partial first reading, 168

Perception, training in, 251
visual and auditory, 151
Periods of confusion, 147
Phonetics and reading, 150
Phonetics, training in, 221
Phonogram stage, 7 f.
Photographic records of arithmetic reading, 170
Photographing of eye-movements, 52 ff.
Physiological basis of reading, 51 ff.
Pictograph stage, 5 ff.
Pictures, function of, 43 ff.
Pintner, R., 26
Planning instruction, 193
Popular psychology of reading, 122
Practical value of reading, 19 ff.
Practice in rapid silent reading, 249
Premonitions in reading, 268 f.
Preparation, in class work, 260
Primary grades, 107
Problem-solving attitude, 167
Psychological distinctions, 149
Psychology of reading, 30 ff.
Purpose in reading, 126, 252

Rate of recognition, 97
growth in, 98 f.
Rate of silent reading, factors influencing it, 249
Reading, comparison of oral and silent, 25 ff.
fundamental elements of, 93 f.
general ability in, 166
mechanical, 46
rate, 26 ff.
special ability in, 166
Reading complex, 88 ff.
Reading patterns, 121
Rebus-Phonogram stage, 8 f.
Recognition span, 101 f.
Recognition unit, 98
Regressive movements, 56 ff.
Regularity of eye-movements, 103
Remedial instruction, 187
Re-reading, 168
Ruskin, J., 13 f.

School methods, 125
Scores, interpretation of, 185
Silent reading, its value, 33 ff.
emphasize, 37 ff.
Skimming and reading, 154
Skipping, 118, 173
Span of recognition, 219
exercises to increase it, 234
Speaking vocabulary, 223
Special methods, 130
Specific causes of reading failures, 213
Specific training in reading, 129
Speech defects, 226
Spelling and reading, 149
Standardized reading tests, 188 f.
Standardized tests, 181 ff.
Starch, D., 40
Stone, C. R., 196, 201 f.
Study attitude, 130
contrasted with reading attitude, 131
Subject-matter of reading, 251

Taylor, I., 10
Teacher's preparation, 278
Technique, need of specific, 153
Technique in teaching reading, 87 ff.
Technique of diagnosis, 208
Terry, P. W., 166 ff.
Testing, four steps in, 184
Tests, standardized, 87 ff.
Time control, 255
Timidity in reading, 230

Vision, defective, 218

extra-foveal, 267
foveal, 279
Visual span, 95 f.
Vocabulary usage, 147
Vocalization, 90
decrease of, 250

Waldo, K. D., 290
Wallin, J. E., 216
Will to read rapidly, 255
Willard, G. W., 217

Yazer, M., 227

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